TABLE OF CONTENTS

ALL VOLUMES

R645-301-100 Through R645-301-800

Prepared by

MT. NEBO SCIENTIFIC, INC.
330 E. 400 S., Suite 6
Springville, UT 84663
(801) 489-6937

by

Patrick D. Collins, Ph.D.

for

COAL HOLLOW PROJECT
Post Office Box 1230
Huntington, Utah 84528

May 25, 2007

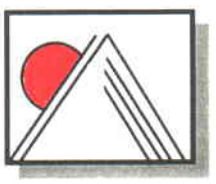


TABLE OF CONTENTS

Chapter 3

R645-301-300

BIOLOGY

R645-301-300. BIOLOGY

310. INTRODUCTION

The following section to be submitted to the State of Utah, Division of Oil, Gas & Mining (DOGM) describes the biological resources of the Coal Hollow Project near the town of Alton, Utah. Because the area is so well studied, and to provide important initial baseline data, some of the information herein was gathered from previous reports and other sources. Updates to these data sets will be a continuous undertaking. This chapter contains information including the following:

311. Vegetative, fish, and wildlife resources of the permit area and adjacent areas as described under R645-301-320.

312. Potential impacts to vegetative, fish and wildlife resources and methods proposed to minimize these impacts during coal mining and reclamation operations as described under R645-301-330 and R645-301-340.

313. Proposed reclamation designed to restore or enhance vegetative, fish, and wildlife resources to a condition suitable for the designated postmining land use as described under R645-301-340.

320. ENVIRONMENTAL DESCRIPTION

321. VEGETATION INFORMATION

321.100. Plant Communities of the Permit Area

The first vegetation map prepared for the Coal Hollow Project delineated the plant communities that exist within the permit area (*Vegetation Map*, Drawing 3-1). This map was created using information from an existing map that was prepared from previous work [*Vegetation Community Map*, Exhibit No. 6.4-1 (7/13/87), Utah International Inc. by Cedar Creek Associates, Inc.]. However, a new flight was conducted for the Coal Hollow Project in 2006 that provided aerial photography and more detailed information that had previously been available. This aerial photography and photogrammetric mapping has been used in preparation of many updated maps of the project area, including a new vegetation map. The new vegetation map for the Coal Hollow project not only provides more detailed information, but it also reflects any changes over- time to the plant communities within the permit and adjacent areas (*Vegetation Map,* Drawing: 3-1b, dated 12/20/06). For example, potential changes to the communities over-time may have occurred such as sagebrush communities converted to pasture lands or juniper trees encroaching into sagebrush zones. Because the first *Vegetation Map* (Drawing 3-1) continues to provide support for some of the data contained in the MRP (explained below), it has been temporarily retained for review in this document.

Like the earlier vegetation mapping information, and because the area has been studied previously, existing quantitative data sets were also available for the plant communities of the Coal Hollow Project area. These data were recorded in the late-1980s. The aforementioned earlier *Vegetation Map* (Drawing 3-1) corresponds to this early vegetation information. The early data sets have been included in the following sections of the MRP. Although this information is valuable because it provides baseline data for that time period, plans to re-sample the same plant communities to update the existing data were made when the Coal Hollow Project was first proposed. The new quantitative sampling was scheduled to be conducted prior to any new disturbance by the proposed new mining activities. Furthermore, because the mining operations will be done in sequence over a period of several years, the sampling regime has been designed to focus on those plant communities that will be disturbed first, *or in the sequential order of the mining activities*. Most of the sampling in areas for Year 1 of the proposed new mine has already been conducted. Additional sampling will be conducted beforehand, and as the mining progresses. The new data recorded for the Coal Hollow Project area will correspond to the new *Vegetation Map* (Drawing: 3-1b) of the MRP, however, as mentioned above, the earlier map has also been retained in the MRP because of its relevance to the early data sets. Once all of the plant communities have been re-sampled and correspond to the new map, the data and early map will probably be removed from the MRP or placed in an appendix so it remains available for review.

Acreage of the each plant community and map symbols present in the Coal Hollow Project permit area on the earlier *Vegetation Map* (Drawing 3-1) are shown on Table 3-1. Similarly, the

most recent *Vegetation Map* (Drawing 3-1b) information is shown on Table 3-1b.

Color photographs recently taken of the general Coal Hollow Project area showing all plant community types together are shown on Photographs 3-1 *through* 3-3. Photographs of each individual plant community that could be impacted by the project area and correspond to the *Vegetation Map* (Drawing 3-1) are shown on Photographs 3-4 *through* 3-10. Most photographs have been inserted near the end of this chapter and in the individual reports in the appendices.

Table 3-1: Vegetation Communities of the Coal Hollow Permit Area

MAP SYMBOL (see *Vegetation Map*, Drawing 3-1)	PLANT COMMUNITY	TOTAL ACREAGE
SB	Sagebrush	191.06
M	Meadow	174.99
PL	Pasture Land	100.50
PJS	Pinyon-Juniper/Sagebrush	66.43
MB	Mountain Brush	58.12
PJM	Pinyon-Juniper/Mountain Brush	19.79
PJW	Pinyon-Juniper Woodland	7.50
	Total*	**618.39**

Table 3-1b: Vegetation Communities of the Coal Hollow Permit Area

MAP SYMBOL (see *Vegetation Map*, Drawing 3-1b)	PLANT COMMUNITY	TOTAL ACREAGE
S/G	Sagebrush/Grass	212.00
P	Pasture Land	192.00
P-J	Pinyon-Juniper	114.00
M	Meadow	69.00
OB	Oak Brush	40.00
RB/SB	Rabbitbrush/Sagebrush	3.00
	Total*	**630.00**

* The tables have slightly different total acreage due to updated information from the most recent ground survey of the permit area.

As mentioned, previous quantitative sampling was conducted in the late-1980's for most of the plant communities of the region. Because the work accomplished at that time included a much larger study area, there were more plant communities that could have been impacted by the proposed project back then. The Coal Hollow Project area is much smaller, so only the plant communities to be impacted by the current project have been studied for this document. Existing vegetation data are shown on Tables 3-2 *through* 3-13. These data sets will be updated by conducting additional quantitative sampling. This sampling began in the 2006 field season. Following is a brief summary of each of the plant communities to be impacted by the Coal Hollow Project. The summaries were based on the quantitative data recorded in the earlier studies, as well as field work accomplished from 2005-present where qualitative and quantitative data were recorded.

Sagebrush/Grass

One of the most common plant communities of the Coal Hollow permit area is Sagebrush/Grass (see *Vegetation Map*, Drawing 3-1b). This is one community that may have changed a little over-time because sagebrush areas are often plowed by landowner to increase pasture land for domestic livestock.

The sagebrush community types in the permit area can be dominated by either big sagebrush (*Artemisia tridentata* var. *tridentata*) or black sagebrush (*A. nova*). In the Sagebrush/Grass community proposed for disturbance, both species were nearly equally represented. The total living cover for the community was 54.73% [Table 3-2 (A)]. Shrubs dominated the composition here representing 64.09% of the total living understory cover, followed by grasses at 34.64%, and forbs at 1.28% [Table 3-2 (B)]. The dominant plant species as shown in the species cover values (Table 3-3) were big sagebrush, black sagebrush, jungrass (*Koeleria macrantha*), and Sandberg's bluegrass (*Poa secunda*).

Because the Sagebrush/Grass community is proposed for disturbance Year 1 in the mining plan, quantitative sampling was conducted in the growing season of 2006. The paragraph above reflects a summary of specific parameters from the recent sampling. For the complete report that provides methodologies and additional parameters, refer to *Vegetation of the Sagebrush/Grass & Meadow Areas*: 2006 (Appendix 3-2).

For recent photographs of this vegetation type, refer to Photograph 3-4 in this chapter (Chapter 3), plus those provided in the final report called *Vegetation of the Sagebrush/Grass & Meadow Areas*: 2006 (Appendix 3-2).

Meadows

There are different meadowlands located within the permit area. These meadows have somewhat been differentiated on the *Vegetation Map* (Drawing: 3-1b) as dry, wet or somewhat between the two. The Year 1 mining operations would disturb a dry meadow community on the west side of the permit area.

Because a meadow community is proposed for disturbance in Year 1 mining operations, recent quantitative sampling has been conducted. The total living cover was estimated at 73.00% [Table 3-4 (A)]. The composition of the understory was 75.71% grasses (and grass-likes), 13.28% forbs, and 11.01% shrubs [Table 3-4 (B)]. The complete final report is called *Vegetation of the Sagebrush/Grass & Meadow Areas*: 2006 (see Appendix 3-2).

As shown on Table 3-5, the dominant species in the proposed disturbed Meadow were grass and grass-like species including sedge (*Carex* sp.), wiregrass (*Juncus arcticus*) and junegrass (*Koeleria micrantha*). Broom snakeweed (*Gutierrezia sarothrae*) was the dominant shrub, whereas the dominant forbs were yarrow (*Achillea millefolium*) and Pacific aster (*Aster ascendens*).

For more information about the quantitative data and sampling methodologies, refer to the aforementioned recent final report called *Vegetation of the Sagebrush/Grass & Meadow Areas*: 2006 (see Appendix 3-2). Recent photographs of this community have been provided in that final report (Appendix 3-2) and also Photograph 3-5 of this chapter (Chapter 3).

Pasture Land

Pasture Lands in the area are often areas that had been cleared of their woody vegetation to provide more herbaceous foliage for livestock (Photograph 3-6). These areas have been used by property owners as dryland pastures in the past and present. Moisture from groundwater appears to be an important component for productivity in the Pasture Lands and Meadows within the permit area.

Because these areas did not contain many native plant species or they were used for grazing, species composition and productivity would be highly variable. Quantitative sampling has not been conducted in these altered plant communities.

Pinyon-Juniper/Sagebrush

A transitional plant community found in the Coal Hollow permit area was the Pinyon-Juniper/Sagebrush (Photograph 3-7). This community was more common than some of the communities, but still consists of relatively small areas located mostly in the northern and western areas of the permit area (see *Vegetation Map*, Drawing 3-1).

The total living understory of this area has been estimated at 40.40% [Table 3-6 (A)]. The understory composition was comprised of 61.39% shrubs, 17.33% trees, 16.34% forbs, 4.62% grasses, and 0.33% succulents [Table 3-6 (B)].

Table 3-7 shows that the most common plant species represented in the cover estimates were black sagebrush, Utah juniper (*Juniperus osteosperma*), big sagebrush, and desert phlox (*Phlox austromontana*). The study area where the quantitative data were taken for this Pinyon-Juniper/Sagebrush community happened to be in an area where black sagebrush was the most

common shrub species; in other Pinyon-Juniper/Sagebrush communities within the permit area, big sagebrush was the dominant shrub.

Mountain Brush

A Mountain Brush community has been identified in the permit area (see *Vegetation Map*, Drawing 3-1). *Mountain Brush* can refer to several woody species in the Alton Amphitheater area. This is a broad community name and can be made up of different species in the community types named for it. Several woody species can be used to identify the Mountain Brush component of the community including scrub oak brush (*Quercus gambelii*), alder-leaf mountain-mahogany (*Cercocarpus montanus*), squaw-apple (*Peraphyllum ramosissimum*), and Utah serviceberry (*Amelanchier utahensis*), all of which are present in the Alton Amphitheater area. In the permit area, however, the common woody species that drives the community name was scrub oak brush (Photograph 3-8).

Total living cover of the Mountain Brush community was estimated to be 65.47% [Table 3-8 (A)]. As one would expect, shrubs represented the greatest proportion of the composition at 88.70% (scrub oak brush could be considered a small tree rather than a shrub; in this document, however, it has been categorized as a shrub), followed distantly by grasses at 7.94%, forbs at 3.16%, and trees at 0.305% [Table 3-8 (B)].

Cover measurements by species are shown on Table 3-9. This table indicates that the most common species in the Mountain Brush community were scrub oak brush, big sagebrush, serviceberry, Western wheatgrass (*Elymus smithii*), snowberry (*Symphoricarpos oreophilus*), and crested wheatgrass (*Agropyron wheatgrass*).

Pinyon-Juniper/Mountain Brush

Another plant community identified in the permit area was transitional between the Pinyon-Juniper Woodland and the Mountain Brush communities (Photograph 3-9). This plant community is a minor component of the acreage in the permit area (see *Vegetation Map*, Drawing 3-1), but it is more common in adjacent areas.

The total living cover of the Pinyon-Juniper/Mountain Brush community has been estimated at 58.87% [Table 3-10 (A)]. Shrubs were the major component of composition in this community comprising 84.71% of the total living cover, followed by trees, forbs, grasses and succulents [Table 3-10 (B)].

The Alton Amphitheater, or the entire area of which the permit area is a part, supports several plant communities that could be considered "Pinyon-Juniper/Mountain Brush". The species most common in the Pinyon-Juniper/Mountain Brush of the permit area was scrub oak brush. Accordingly, the most common species in the Pinyon-Juniper/Mountain Brush of the permit area were scrub oak brush, serviceberry, pinyon pine (*Pinus edulis*), and Utah juniper (Table 3-11).

Pinyon-Juniper Woodland

Although pinyon pine and Utah juniper trees are strong components in other plant communities in the Coal Hollow permit area, acreage is relatively small for the pure Pinyon-Juniper Woodland community (Photograph 3-10). This community is located at the extreme northern border of the permit area (see *Vegetation Map*, Drawing 3-1).

Total living understory cover of the Pinyon-Juniper Woodland community has been estimated at 11.93% [Table 3-12 (A)]. Of that living cover, 47.49% of it was comprised from trees, 27.92% shrubs, 22.91% forbs, and 1.12% grasses [Table 3-12(B)]. The most common species by cover of the community were pinyon pine, Utah juniper and desert phlox. For a list of the remainder of the plant species present in the samples by cover, refer to Table 3-13.

Table 3-2: Total Cover and Composition of the Sagebrush/Grass Community in the Coal Hollow Project Area.

Source: Vegetation of the Sagebrush/Grass & Meadow Areas. 2006. Mt. Nebo Scientific, Research & Consulting, Springville, UT.

A. TOTAL COVER	PERCENT COVER	
Understory Cover (u)	52.400	
Bareground	26.867	
Litter	16.167	
Rock	4.567	
TOTAL	100.00	
Overstory Cover (o)	2.333	
TOTAL LIVING COVER (o + u)	54.733	
B. COMPOSITION (u)	**PERCENT COVER**	**RELATIVE COVER**
Shrubs	33.466	64.086
Grasses	18.166	34.636
Forbs	0.766	1.278
TOTAL		100.000

Table 3-3: Cover by Species of the Sagebrush/Grass Community in the Coal Hollow Project Area.

Source: Vegetation of the Sagebrush/Grass & Meadow Areas. 2006. Mt. Nebo Scientific, Research & Consulting. Springville, UT.	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY COVER			
Juniperus osteosperma	2.33	9.55	6.67
UNDERSTORY COVER			
TREES & SHRUBS			
Artemisia nova	14.93	17.10	50.00
Artemisia tridentata var. tridentata	15.23	20.48	26.67
Chrysothamnus depressus	2.07	5.90	16.67
Gutierrezia sarothrae	1.23	2.79	20.00
FORBS			
Eriogonum racemosa	0.33	1.25	6.67
Gilia aggregata	0.33	1.25	6.67
Linum perenne	0.10	0.54	3.33
GRASSES			
Bouteloua gracilis	2.33	8.54	10.00
Bromus tectorum	0.83	3.18	6.67
Elymus smithii	0.50	1.98	6.67
Elymus trachycaulus	0.50	1.98	6.67
Hordeum jubatum	0.83	1.86	16.67
Koeleria macrantha	4.17	10.25	23.33
Poa pratensis	3.17	7.69	16.67
Poa secunda	4.00	7.00	30.00
Stipa hymenoides	1.83	3.53	23.33
TOTAL	54.73		

Table 3-4: Total Cover and Composition of the Meadow Community (dry) in the Coal Hollow Project Area.

Source: Vegetation of the Sagebrush/Grass & Meadow Areas. 2006. Mt. Nebo Scientific, Research & Consulting, Springville, UT.

A. TOTAL COVER	PERCENT COVER
Living Cover	73.000
Bareground	15.500
Litter	9.400
Rock	1.000
TOTAL	100.000

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Shrubs	8.200	11.013
Grasses	54.90	75.705
Forbs	9.900	13.282
TOTAL	73.000	100.000

Table 3-5: Cover by Species of the Meadow Community (dry) in the Coal Hollow Project Area.

Source: Vegetation of the Sagebrush/Grass & Meadow Areas. 2006. Mt. Nebo Scientific, Research & Consulting. Springville, UT.	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia nova	1.00	2.00	20.00
Gutierrezia sarothrae	7.20	4.80	85.00
FORBS			
Achillea millefolium	6.40	6.42	55.00
Aster ascendens	2.00	4.00	25.00
Eriogonum racemosa	0.25	1.09	5.00
Linum lewisii	1.00	3.39	10.00
Potentilla anserina	0.25	1.09	5.00
GRASSES			
Bouteloua gracilis	2.25	6.80	10.00
Carex sp.	27.50	19.46	75.00
Elymus elymoides	0.50	1.50	10.00
Elymus smithii	0.75	2.38	10.00
Hordeum jubatum	0.50	2.18	5.00
Juncus arcticus	10.25	13.27	70.00
Koeleria macrantha	8.00	10.17	55.00
Muhlenbergia asperifolia	0.50	2.18	5.00
Poa pratensis	4.65	10.62	25.00
TOTAL	73.000		

Table 3-6: Total Cover and Composition of the Pinyon-Juniper/Sagebrush Community (PJS) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	40.400
Bareground	29.000
Litter	26.933
Rock	2.200
Pavement	1.467
TOTAL	100.000

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	7.000	17.327
Shrubs	24.800	61.386
Grasses	1.867	4.621
Forbs	6.600	16.337
Succulents	0.133	0.329
TOTAL	40.400	100.000

Table 3-7: Cover by Species of the Pinyon-Juniper/ Sagebrush Community (PJS) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	5.200
Pinus edulis	1.800
SHRUBS	
Amelanchier utahensis	1.133
Artemisia nova	14.000
Artemisia tridentata	4.467
Gutierrezia sarothrae	0.533
Peraphyllum ramosissimum	2.733
Purshia tridentata	0.733
Quercus gambelii	1.200
GRASSES	
Bromus tectorum	0.133
Elymus smithii	0.067
Elymus elymoides	1.600
Poa secunda	0.067
FORBS	
Astragalus megacarpus	0.200
Astragalus wizlensia	0.067
Clarkia sp.	0.133
Cymopterus purpureus	0.067
Erigeron caespitosus	1.133
Eriogonum sp.	0.333
Lappula occidentalis	0.133
Lappula occidentalis	0.533
Lycopodium sp.	0.133
Phlox austromontana	3.067
Salsola tragus	0.200
Sphaeralcea coccinea	0.600
SUCCULENTS	
Opuntia polyacantha	0.133
TOTAL	40.398

Table 3-8: Total Cover and Composition of the Mountain Brush Community (MB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	65.467
Bareground	6.133
Litter	28.067
Rock	0.333
Pavement	0.000
TOTAL	100.000

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	0.200	0.305
Shrubs	58.066	88.695
Grasses	5.200	7.943
Forbs	2.001	3.057
Succulents	0.000	0.000
TOTAL	65.467	100.000

Table 3-9: Cover by Species of the Mountain Brush Community (MB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	0.133
Pinus edulis	0.067
SHRUBS	
Amelanchier utahensis	4.400
Artemisia tridentata	5.933
Cercocarpus montanus	0.067
Chrysothamnus greenei	0.067
Ephedra viridis	0.200
Prunus virginiana	0.600
Quercus gambelii	43.866
Rosa woodsii	0.333
Symphoricarpos occidentalis	2.600
GRASSES	
Agropyron cristatum	1.600
Bromus inermis	0.600
Elymus smithii	2.800
Poa pratensis	0.133
Stipa hymenoides	0.067
FORBS	
Achillea millefolium	0.067
Astragalus rotundifolia	0.133
Balsamorhiza sagittata	0.200
Erigeron pumilus	0.067
Lappula occidentalis	0.133
Lappula sp.	0.067
Medicago sativa	0.067
Phlox austromontana	0.333
Taraxacum officinale	0.067
Vicia americana	0.867
SUCCULENTS	0.000
TOTAL	65.467

Table 3-10: Total Cover and Composition of the Pinyon-Juniper Mountain Brush Community (PJM) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	58.867
Bareground	8.467
Litter	28.400
Rock	1.467
Pavement	2.800
TOTAL	100.001

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	6.866	11.664
Shrubs	49.867	84.713
Grasses	0.467	0.793
Forbs	1.533	2.604
Succulents	0.133	0.226
TOTAL	58.866	100.000

Table 3-11: Cover by Species of the Pinyon-Juniper Mountain Brush (PJM) Community in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	1.133
Pinus edulis	5.733
SHRUBS	
Amelanchier utahensis	6.267
Arctostaphylos sp.	0.067
Artemisia tridentata	2.267
Cercocarpus montanus	1.933
Peraphyllum ramosissimum	1.533
Prunus virginiana	0.200
Purshia tridentata	0.333
Quercus gambelii	35.200
Symphoricarpos occidentalis	2.067
GRASSES	
Poa pratensis	0.200
Poa secunda	0.267
FORBS	
Balsamorhiza sagittata	0.067
Cymopterus purpureus	0.067
Erigeron caespitosus	0.067
Eriogonum ovalifolium	0.067
Lupinus kingii	0.067
Lycopodium sp.	0.200
Phlox austromontana	0.533
Verbascum thapsus	0.067
Vicia americana	0.400
SUCCULENTS	
Yucca harrimaniae	0.133
TOTAL	58.868

Table 3-12: Total Cover and Composition of the Pinyon-Juniper Woodland Community (PJW) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	11.933
Bareground	38.466
Litter	32.600
Rock	3.933
Pavement	13.067
TOTAL	99.999

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	5.667	47.486
Shrubs	3.332	27.920
Grasses	0.134	1.123
Forbs	2.734	22.909
Succulents	0.067	0.561
TOTAL	11.934	100.000

Table 3-13: Cover by Species of the Pinyon-Juniper Woodland Community (PJW) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	1.400
Pinus edulis	4.267
SHRUBS	
Amelanchier utahensis	0.800
Artemisia nova	0.333
Artemisia tridentata	0.333
Cercocarpus montanus	0.200
Gutierrezia sarothrae	0.333
Peraphyllum ramosissimum	0.600
Quercus gambelii	0.400
Symphoricarpos occidentalis	0.333
GRASSES	
Elymus elymoides	0.067
Poa secunda	0.067
FORBS	
Achillea millefolium	0.067
Astragalus megacarpus	0.133
Cymopterus purpurascens	0.400
Erigeron caespitosus	0.067
Lepidium sp.	0.067
Penstemon linarioides	0.067
Phlox austromontana	1.333
Salsola tragus	0.533
Unidentifiable	0.067
SUCCULENTS	
Opuntia polyacantha	0.067
TOTAL	11.934

321.200. Productivity

Productivity measurements were recorded for the plant communities of the permit area during the same sample period as described in section 321.100 above. Production estimates for the communities at that time are shown in Table 3-14. Additional current annual biomass production estimates will be made by field measurements or engaging the services of a range conservationist from the USDA Natural Resources Conservation Service (NRCS).

Table 3-14: Biomass Production of Plant Communities in the Coal Hollow Permit Area

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project, Alton, Utah.

MAP SYMBOL (see *Vegetation Map*, Drawing 3-1)	PLANT COMMUNITY	TOTAL PRODUCTION (lbs/acre)
SB	Sagebrush	899.54
M	Meadow	2120.82
PL	Pasture Land	n/a
PJS	Pinyon-Juniper/Sagebrush	508.87
MB	Mountain Brush	1470.59
PJM	Pinyon-Juniper/Mountain Brush	1146.91
PJW	Pinyon-Juniper Woodland	33.09

322. FISH AND WILDLIFE INFORMATION

322.100. Agency Consultation and Studies Conducted

Initial consultations have been made to appropriate state and federal agencies regarding threatened, endangered, and sensitive plant and animal species and their habitats in and adjacent to the Coal Hollow permit area. A summary of this work follows.

- In 2005, a review of the Utah Heritage Program database for sensitive species in the proposed project and adjacent areas was accomplished.

- A spreadsheet has been prepared that shows applicable notes from previous biological surveys of the area.

- Biologists from the USDA Dixie National Forest have been contacted. Life histories and analyses of the species in their forest and in close proximity to the Coal Hollow Project area that have been listed as endangered, threatened, candidate, and management indicator species has been prepared to be used for project planning and agency consultations.

- Files from the offices of *Mt. Nebo Scientific, Inc.* regarding sensitive species have been consulted for the project area.

- A sage-grouse lek had been located in the area by biologists from the Bureau of Land Management (BLM) and the State of Utah, Division of Wildlife Resources (DWR). In the Spring of 2005 biologists from the BLM captured, collared and began monitoring 4 sage-grouse birds to study the lifecycle and migrating patterns of the local birds.

- In June 2005, a field survey for potential habitat of sensitive species within the project and adjacent areas was conducted by N. Duane Atwood, Ph.D. and Patrick D. Collins, Ph.D.

- In April 2006, a biologist, Steven L. Petersen, Ph.D., representing the Coal Hollow Project began independent studies and also began participating with the BLM and DWR in sage-grouse studies in the project area.

- In May 2006, a raptor survey by helicopter was conducted by Talon Resources, Mt. Nebo Scientific, Inc., and DWR of the permit area and adjacent areas.

- In August 2006 sensitive plant species surveys were conducted during quantitative sampling of proposed disturbed and reference areas for the project.

- In 2007 the team has continued studies of the sage-grouse with biologists from DWR, the BLM, Southern Utah University (SUU), and the Coal Hollow Project by capturing, taking blood samples, and placing radio transmitters on several birds from March through May.

- In April 2007, two helicopter flights, arranged by Alton Coal Project, were conducted to search for satellite leks of the sage-grouse.

- In May 2007, another raptor survey by helicopter was conducted by DWR that included the permit area and adjacent areas.

322.200. Site-Specific Resource Information

A review of the Utah Heritage Program database for sensitive species in the proposed mine site and adjacent areas has been accomplished. Field maps with locations of these species have been prepared and have been used for additional surveys and will continue to be used for future biological studies.

Due to the sensitivity of these species, specific location information is considered confidential and has not been submitted in this application. However, review of this information by the regulatory authorities can be arranged .

322.210. Threatened, Endangered, and Candidate Plant and Animal Species

Table 3-15 shows a list of the plant and animal species that are federally listed as threatened, endangered, or candidates for this designation for Kane County, Utah.

Table 3-15: List of Threatened, Endangered, and Candidate Plant & Animal Species in Kane County, Utah		
SCIENTIFIC NAME	COMMON NAME	STATUS*
PLANTS		
Asclepias welshii	Welsh's Milkweed	T
Carex specuicola	Navajo Sedge	T
Cycladenia humilis var jonesii	Jones Cycladenia	T
Lesquerella tumulosa	Kodachrome Bladderpod	E
Pediocactus sileri	Siler Pincushion Cactus	T
ANIMALS		
Cicindela limbata albissima	Coral Pink Sand Dunes Tiger Beetle	C
Coccyzus americanus	Yellow-billed Cuckoo (possible)	C
Cynomys parvidens	Utah Prairie-dog	T
Empidonax traillii extimus	Southwestern Willow Flycatcher	E
Gila cypha	Humpback Chub (historical)	E
Gilia elegans	Bonytail (historical)	E
Gymnogypes californianus	California Condor	Exp
Haliaeetus leucocephalus	Bald Eagle	T
Oxyloma kanabense	Kanab Ambersnail	E
Ptychocheilus lucius	Colorado Pikeminnow (historical)	E
Strix occidentalis lucida	Mexican Spotted Owl	T
Xyrauchen texanus	Razorback Sucker (historical)	E
* T=Threatened, E=Endangered C=Candidate, Exp=Experimental		

In summary, based on the information provided above and studies conducted to-date, no threatened or endangered species have been located in the permit area.

322.220. High Value Habitats

The State of Utah, Division of Wildlife Resources (DWR) geographic information system (GIS) database was consulted for high-value habitats. Of the species maintained on the database, important habitat of four species have been mapped by DWR within or adjacent to the Coal Hollow Project area. These habitats are described below.

First, black bear (*Ursus americanus*) habitat was located on the east side of the permit area and continues east for some distance (Drawing 3-2). This habitat has been listed as "year-long" and classified as having "substantial" habitat by DWR.

Next, Rocky Mountain elk (*Cervus canadensis*) habitat was located in the area. "High-value" summer range was mapped throughout the entire area from the town of Alton south into Sink Valley. Additionally, year-long "substantial" habitat was located in areas southeast of the permit area (Drawing 3-3).

Mule deer (*Odocoileus hemionus*) habitat has also been mapped in the area by DWR. The habitat has been classified as "high-value" summer range and was located throughout the permit and adjacent areas (Drawing 3-4).

Finally, sage-grouse (*Centrocercus urophasianus*) habitat has been documented in the project area. DWR has mapped much of the area to be brood habitat (Drawing 3-5). Sage-grouse populations continue to be monitored in the area by biologists from DWR, Bureau of Land Management (BLM), Southern Utah University (SUU), and the Coal Hollow Project. The only lek in the vicinity including those areas around Alton and Sink Valley was located west of the Swapp Ranch. This lek was within the permit area boundary. A site-specific study called "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" has been conducted for the Coal Hollow Project and has been included in this document (see **Appendix 3-1**). Follow-up studies of the sage-grouse in the area are described in a report called *"Sage-grouse Distribution and Habitat Improvement in Alton, Utah*" (see **Appendix 3-3**).

In 2006 to the present, biologists representing the Coal Hollow Project have been involved with a previously assembled team of biologists that have been studying the populations in the area. In 2007, the team captured, took blood samples for DNA analyses, and placed radio collars on several birds. For more details refer to **Appendix 3-3**.

In addition to studying the sage-grouse birds as described above, techniques to improve habitat for the birds is currently being conducted. An effort by the U.S. Department of Interior, Bureau of Land Management (BLM) and the State of Utah, Division of Wildlife Resources (DWR) removed many of the juniper trees that have encroached the valley by grinding them up by chipping equipment. These areas can be easily seen on the new *Vegetation Map* (Drawing: 3-1b). These areas are delineated as "SB (chipped)" on the map.

Because they provide perching structure for predatory species, single juniper trees scattered

throughout sagebrush communities are known to discourage nesting by sage-grouse. To enhance sage-grouse nesting habitat within the permit area, juniper trees that have encroached some of the sagebrush communities in the valleys of the permit area have been removed by a track hoe using a large grapple claw. This equipment can pull the trees out of the ground, including the roots. To date, it has been estimated that 2,000 juniper trees have been removed by this technique. In doing so, the technique causes relatively minor impacts to the sagebrush component of the community.

In addition to the habitat improvements mentioned above for sage-grouse, seed mixtures to restore pasture lands disturbed by mining will include plant species that are used by the birds for food, cover and breeding. Moreover, one area that is presently dominated by grass species for domestic livestock use, will be seeded with plants that include species known to provide nesting habitat for sage-grouse such as big sagebrush and black sagebrush (see Postmining Land Use, Chapter 4, for more detailed information).

322.230. Other Species or Habitats

To date, no other species or habitats have been identified through agency consultation or field studies that require special protection under state or federal law, however, if they are found through the permitting process, they will be appropriately addressed and monitored.

322.300. Fish and Wildlife Service Review

Upon request, the State of Utah, Division of Oil, Gas & Mining (DOGM) will provide the resource information required under R645-301-322 and the protection and enhancement plan required under R645-301-333 to the U.S. Fish and Wildlife Service Regional or Field Office for their review. This information will be provided within 10 days of receipt of the request from the Service.

323. MAPS AND AERIAL PHOTOGRAPHS

323.100. Reference Area Maps

Vegetation maps have been prepared for the Coal Hollow Project area (Drawing 3-1; Drawing 3-1b). The latter drawing is the new vegetation map that updates the former. Existing vegetation data from early studies (1987) in the area have been provided in the MRP as well as new data sets from ongoing studies being conducted as the mining progresses. The aforementioned earlier *Vegetation Map* (Drawing 3-1) corresponds to this early vegetation information. Although this information is valuable because in provides maps and data sets for that time period, plans to re-sample the same plant communities were made. This quantitative sampling has been and will continue to be conducted prior to new disturbance by the proposed new mining activities. Furthermore, because the mining operations will be done in sequence over a period of several years, the sampling regime has been designed to focus on those plant communities that will be disturbed first, or in the early phases of the mining operations. Most sampling in areas for Year 1 of the proposed new mine has already been conducted. Additional sampling will be conducted beforehand and as the mining continues. The new data recorded for the Coal Hollow Project area corresponds to the new *Vegetation Map*, Drawing: 3-1b in the MRP. This sampling includes Reference Areas, or plant communities sampled that are similar to those that have been proposed for disturbance by mining activities. These Reference Areas will be compared to those areas proposed for disturbed during the initial studies for the mine site and will consequently be used as revegetation success standards at the time of final reclamation of mined areas. Reclamation is planned immediately after portions of land is mined (see Chapter 5). All recent sample areas including reference areas will be shown on the most recent vegetation map.

323.200. Sample Area Maps

Elevations, locations of monitoring stations, proposed disturbed areas, reference areas, and other areas used to gather data for fish and wildlife, and any special habitat features, will be delineated on the aforementioned new maps.

323.300. Protection and Enhancement of Fish & Wildlife Maps

Each facility to be used to protect and enhance fish and wildlife and related environmental values will also be represented on the new maps.

323.400. Plant Communities Map

An initial vegetation map was prepared that delineated the plant communities that exist within the Coal Hollow Project permit area (*Vegetation Map*, Drawing 3-1). This map was prepared using an existing map [*Vegetation Community Map*, Exhibit No. 6.4-1 (7/13/87), Utah International Inc. by Cedar Creek Associates, Inc.]. A new flight was conducted in 2006 to provide aerial photography with more detailed information and for preparation of updated maps of the project area (see also section 321.100). Consequently, a new vegetation map has been

prepared and updated to reflect any changes to the plant communities within the permit and adjacent areas (*Vegetation Map,* Drawing: 3-1b).

330. OPERATION PLAN

331. MINE PLAN & RECLAMATION TIMING

In each mined segment, the mine plan includes redistributing subsoil and topsoil followed by seeding this segment with the final seed mix contemporaneously, or at the same time the mining begins in the next segment. The mine plan has been engineered to disturb the smallest practicable area at any one time. With prompt establishment and maintenance of vegetation, immediate stabilization of disturbed areas will minimize surface erosion. Details of the plan have been provide in Chapter 5 of this document.

332. SUBSIDENCE

Because mining in the Coal Hollow Project area will be a surface operation, and subsidence is usually associated more with underground mining, it is not considered a factor for the Coal Hollow Project. However, current elevation of the existing topography may be slightly altered in the mining and reclamation operations. Reclamation has been planned to minimize the impact to the renewable resources identified in this section by promptly reclaiming each mine segment contemporaneously by controlling erosion and re-seeding with a mixture of native plant species that will re-establish the plant communities to vegetative cover that will be diverse, effective, permanent, and consistent with the postmining land use. More details regarding postmining land and topography have been provided in Chapter 4 and Chapter 5 of this document, respectively.

The mine plan is not expected to negatively impact the plants and wildlife in the Coal Hollow Project area. Onsite revegetation research and sage-grouse mitigation plans have been designed. Details of this work have been made available to DOGM specialists for their comments and participation in the process.

333. PROCEDURES TO MINIMIZE ADVERSE IMPACTS TO FISH & WILDLIFE

The Coal Hollow Project will minimize disturbances and adverse impacts to fish and wildlife and related environmental values during coal mining and reclamation operations. The project will comply with the Endangered Species Act of 1973 during coal mining and reclamation operations.

The location and operation of haul and access roads and support facilities will be placed to avoid or minimize impacts on important fish and wildlife species or other species protected by state or federal law. Enhancement of such resources will be achieved, where practicable. An example is provided below for sage-grouse habitat.

After consultation with appropriate agencies and biologists regarding habitats and sensitive species, the sage-grouse and its habitat were of greatest concern in the area. There has been a decreasing trend in the populations of this species since 1964 (see **Appendix 3.1** and **Appendix 3-3** for more details). There was a general consensus among the biologists and agencies consulted that due to the: 1) marginal habitat in the Alton Amphitheater area, 2) loss of habitat in recent years for nesting and brood-rearing and 3) relatively low population numbers in the area, that the local population of sage-grouse is vulnerable to elimination, regardless of mining activities proposed by the Coal Hollow Project. Accordingly, the following measures to minimize impacts and enhance habitat for this species have been propose and are subject to further consideration by the operator and regulatory agencies.

Short-Term Mitigation Plan

The following information was taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**).

In addition to ensuring the protection of nearby grassland and shrubland for alternate breeding and nesting areas, mining activities will be minimized so that the lowest disturbance will be created during the breeding season at areas adjacent to the original lek. After mining has been completed, reclamation specialists will return the original grade and valley form to pre-disturbance conditions. Reclamation will include seeding similar plant species with comparable plant composition, structure and function as those of the original plant community. In sites used by sage-grouse for breeding and roosting that had previous livestock grazing, livestock will be used post-reclamation to maintain similar vegetation characteristics as pre-mining conditions.

Intact sagebrush stands will be avoided for storing mined subsoil and topsoil piles. Sites could be selected for storing these materials that are distant from prime sage-grouse habitat, in particular potential nesting habitat. Coal processing equipment will be located in areas that create the least possible disturbance to sage-grouse and sage-grouse habitat. Intact sagebrush sites will be cleared of all young juniper trees with the use of chainsaws or hand tools. Trees will be removed from these stands. Juniper woodlands surrounding intact stands can be cut back to increase patch size and increase the amount of area that has the potential for nest site selection by hens.

Long-Term Mitigation Plan

The following information was taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**) and "*Sage-grouse Distribution and Habitat Improvement in Alton, Utah*" (**Appendix 3-3**).

A significant contribution that mining can provide for enhanced sage-grouse habitat is the removal of juniper from the Alton valley. The removal of trees during mining operations with subsequent reclamation activities will create conditions that promote grass, forb and eventually sagebrush establishment. Two years after juniper was removed from plots located in eastern Oregon, Bates et al. (2000) recorded a 200-300% in percent cover and production of herbaceous vegetation. Increased plant community vigor results from decreased competition with juniper for subsurface resources (water, nutrients) and space. As a result, transpiration rates and soil surface evaporation rates will decrease and higher soil moisture will be available for plant growth and survival. Based on anecdotal, evidence, it is also possible that spring discharge will increase and seeps and spring may emerge that were lost with initial encroachment. This would provide more sites where birds would be able to obtain water during the summer and fall months.

Removing trees from extensive areas creates greater connectivity of suitable habitat. In 2005, the BLM cleared portions of the land to increase sagebrush habitat. This improvement was beneficial for improving relatively small site conditions, however, the amount of land treated was minimal compared to the level needed to sustain the sage-grouse population in the Alton area. In 2007, the Coal Hollow Project removed over 2,000 juniper trees that had encroached the sagebrush open areas. Long-term mining plans will remove hundreds of acres of juniper woodlands, significantly increasing conditions that are more suitable to sage-grouse nesting and post- nesting requirements. This landscape-level operation could greatly enhance sagebrush restoration objectives by the BLM that is currently limited by constrained budgets and manpower.

Over time, juniper encroachment has likely been the primary factor in isolating the Alton sage-grouse population from nearby populations. According to local sources, a sage-grouse population is located approximately 6 miles north of Alton. It is likely that migration once occurred between these populations allowing an exchange of individuals and genes between the two populations. Fragmentation of the landscape by juniper has likely resulted in minimal or no movement of birds between the two populations. Similarly, two populations that once occurred further south (near Kanab) have become locally extinct, likely due to the lack of connectivity with more northern populations. According to Fuhlendorf (2001), small populations of prairie chickens became disconnected from other larger populations with increased croplands and juniper invasion. These small populations became locally extinct due to the lack of migration and gene flow potential. Therefore, by reducing the degree of fragmentation caused by expanding juniper, the potential for migration and population sustainability is increased.

Primary brood-rearing habitat in the Alton valley is associated with alfalfa fields near the town of Alton. Birds likely utilize these areas due to the availability of forbs, insects, and water. To

reduce the dependency of the birds on these areas, irrigated alfalfa fields will be created in Swapp Valley (south of the Swapp Ranch house). In addition to alfalfa, many sage-grouse forage species (forbs) will be included in the seed mix. This will increase brood-rearing habitat closer to breeding and nesting habitat. This in turn will reduce potential predation that occurs near towns by ravens, crows, cats, dogs and people. It will also reduce bird mortality associated with large-scale farming practices.

The Alton sage-grouse population could be enhanced by importing birds from nearby populations that are relatively large and stable. Captured and relocated birds (initially 10-15) in the Alton area will increase genetic diversity as well as stabilize population numbers to offset losses associated with disease and emigration (unrelated to mining activities). Additionally, birds from the Alton population (5-10) can be trapped and released in a nearby population through the mining period. Once complete, these birds can be trapped again and returned to the original Alton population. This will ensure the survival of members of the original Alton population.

Habitat Reclamation Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following habitat reclamation plan has been proposed.

Seed mixes that are used for reclamation will consist of native grasses and forb species that provide cover and food in order to accelerate shrub re-establishment, bareroot or potted sagebrush and bitterbrush transplants will be planted. To ensure the integrity of the planting materials, indigenous seed and cuttings could be collected for reclamation. At Bryce Canyon National Park, seed and transplants obtained from indigenous materials had greater long-term survival and higher cover and production than commercial varieties of the same species (Petersen et al. 2004).

Cursory surveys conducted on April 30, 2006 found that there is a low probability that a dominant invasive species (i.e. cheatgrass, medusahead) could establish on reclaimed sites. However, post-reclamation surveys will be conducted for undesirable invasive plants. If a breakout does occur, mechanical followed by chemical treatments will be applied.

Seeding and planting will occur in the fall season following the growing season and into dormancy. During the following growing season, vegetation sampling will be conducted to monitor reclamation success. Measurements will be continued each year until the reclamation goals have been achieved. Additional seeding can be applied during subsequent years if the minimum standards of acceptance have not been achieved. Juniper seedlings found in reclaimed areas will be removed.

Monitoring Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following monitoring plan has been proposed.

Birds trapped and relocated to the Alton population will be collared with radio- collars. Birds will be monitored throughout the year to assess bird survival, nest site and nest success, brood-rearing sites, and key winter habitat areas. Lek counts will be conducted each year to determine the number of birds at the lek. Reclamation sites will be monitored to assess restoration success. With the establishment of desirable plant communities, sagebrush obligate species habitat will be improved. Birds that depend on these communities include sage sparrows (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewer's sparrow (*Spizelis breweri*). Also, mule deer habitat will increase, especially with the establishment of antelope bitterbrush and other palatable browse species. Grassland development will also increase forage for elk (*Cervus canadensis*). Reclaimed sites will be monitored to assess utilization by these and other wildlife species.

To provide consistent monitoring and assessment, plans are being discussed to employ a graduate student from an established university to use this project as the basis for a graduate thesis. This would provide peer-reviewed research and monitoring of this project. It would also provide a mechanism for publishing the results of this project as a source of information and knowledge that can be applied to similar work in other areas.

340. RECLAMATION PLAN

341. REVEGETATION

This document contains the revegetation plan for final reclamation of all lands disturbed by coal mining and reclamation operations, except water areas and the surface of roads approved as part of the postmining land use, as required in R645-301-353 *through* R645-301-357. It also shows how the Coal Hollow Project will comply with the biological protection performance standards of the State Program.

341.100. Reclamation Timetable

A detailed schedule and timetable for the completion of each major step in the mine plan has been included in Chapter 5 of the MRP. Briefly, the mine will conduct operations in one area (segment) at a time. No more than 40 acres will be disturbed at one time for mining. Once mined, the plan includes redistributing subsoil and topsoil followed by seeding this segment with the final seed mix contemporaneously, or at the same time the mining of the next segment begins. However, seeding will be accomplished only in appropriate periods (usually late-fall, but early-spring could also be an option). The mine plan has been engineered to disturb the smallest practicable area at any one time. With prompt establishment and maintenance of vegetation, immediate stabilization of disturbed areas will minimize surface erosion. Details of the plan has been included in Chapter 5 of this document.

341.200. Reclamation Description

The Coal Hollow Project will be reclaimed and revegetated to meet the appropriate postmining land use. Most areas will be reclaimed to the native plant communities that existed prior to mining conditions. Other areas will be reclaimed to enhance habitat for sage-grouse or other wildlife species. Finally, in those areas where the landowner requests a change in the plant community to increase productivity for domestic livestock, they will be reclaimed accordingly.

341.210. Seed Mixtures

Revegetation seed mixtures for each plant community disturbed by mining activities in the Coal Hollow Project area are given in this section. Table 3-16 shows the plant communities that may eventually be disturbed by mining operations at the Coal Hollow Project area.

Table 3-16: Vegetation Communities of the Coal Hollow Permit Area Proposed for Disturbance	
MAP SYMBOL (see *Vegetation Map*, Drawing 3-1b)	PLANT COMMUNITY
S/G	Sagebrush/Grass
P	Pasture Land
P-J	Pinyon-Juniper
M	Meadow
OB	Oak brush
RB/SB	Rabbitbrush/Sagebrush

Seed mixtures for each disturbance type are shown on Tables 3-17 *through* 3-22. These rates have been based on drill seeding methods described in this document. When broadcast seeding is employed these rates will be doubled.

Table 3-17: Revegetation Seed Mixture for the Sagebrush/Grass Community at the Coal Hollow Project

	Rate** (# PLS/Ac)	Seeds/ft^2
SHRUBS		
*Artemisia nova**	0.20	4.16
*Artemisia tridentata**	0.10	5.74
Ceratoides lanata	3.00	3.79
Purshia tridentata	15.00	5.17
Symphoricarpos oreophilus	3.00	5.17
FORBS* **		
Achillea millefolium	0.03	1.91
Hedysarum boreale	5.00	3.86
Linum lewisii	0.70	4.47
Lupinus argenteus	15.00	4.30
Penstemon palmeri	0.30	4.20
Sphaeralcea grossulariifolia	0.40	4.59
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**47.23**	**75.60**

* This species could also to be planted by containerized seedlings at a rate of 200 plants per acre to enhance sage-grouse habitat.

** Based on drill seeding methods

*** Seeds used may be based on commercial availability. Other forb species that would be beneficial for sage-grouse enhancement include: *Achillea millefolium, Agoseris glauca, Crepis acuminata, Gayophytum spp., Lomatium spp., Tragopogon dubius, Trifolium spp.*

Table 3-18: Revegetation Seed Mixture for the Pasture Lands at the Coal Hollow Project

(Final determination to be made by landowners)	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
FORBS**		
Achillea millefolium	0.04	2.54
Astragalus cicer	1.50	4.99
Hedysarum boreale	6.00	4.63
Linum lewisii	1.00	6.38
Medicago sativa	1.00	4.82
GRASSES		
Bromus inermis	1.00	2.87
Dactylis glomeratus	0.20	3.00
Elymus smithii	1.50	4.34
Elymus lanceolatus	1.50	5.30
Elymus junceus	1.00	4.02
Elymus hispidus	2.00	4.27
Phleum pratensis	0.20	5.97
Poa pratensis	0.10	5.00
TOTALS	**17.04**	**58.14**

*Based on drill seeding methods

** Seeds used may be based on commercial availability. Other forb species that would be beneficial for sage-grouse enhancement include: *Achillea millefolium, Agoseris glauca, Crepis acuminata, Gayophytum spp., Lomatium spp., Tragopogon dubius, Trifolium spp.*

Table 3-19: Revegetation Seed Mixture for the Pinyon-Juniper Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	5.00	2.96
Artemisia nova	0.20	4.16
Artemisia tridentata vaseyana	0.07	4.02
Ceratoides lanata	3.00	3.79
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	2.50	4.30
FORBS		
Artemisia ludoviciana	0.04	4.13
Eriogonum umbellatum	1.00	4.80
Hedysarum boreale	5.00	3.86
Lupinus argenteus	15.00	4.30
Sphaeralcea coccinea	0.50	5.74
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus spicatus	1.00	3.21
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**49.81**	**77.67**

*Based on drill seeding methods

Table 3-20: Revegetation Seed Mixture for the Meadow Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
FORBS**		
Iris missouriensis	15.00	7.23
Achillea millefolium	0.10	6.36
GRASSES (or Grass-likes)		
Carex microptera	0.40	7.78
Carex nebrascensis	0.50	6.13
Elymus trachycaulus	2.00	7.35
Phleum pratensis	0.20	5.97
Poa pratensis	0.10	5.00
Poa secunda	0.30	6.37
Scirpus americanus.	2.00	8.26
Sporobolus airoides	0.20	8.03
TOTALS	**20.80**	**68.47**

*Based on drill seeding methods.

** Seeds used may be based on commercial availability. Other forb species that would be beneficial for sage-grouse enhancement include: *Achillea millefolium, Agoseris glauca, Crepis acuminata, Gayophytum spp., Lomatium spp., Tragopogon dubius, Trifolium spp.*

Table 3-21: Revegetation Seed Mixture for the Oak brush Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	10.00	5.92
Artemisia nova	0.20	4.16
Artemisia tridentata var. vaseyana	0.07	4.02
Cercocarpus montanus	3.00	4.06
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	3.00	5.17
Ephedra viridis	8.00	4.59
FORBS		
Artemisia ludoviciana	0.04	4.13
Sphaeralcea coccinea	0.40	4.59
Vicia americana	12.00	5.51
Viguiera multiflora	0.20	4.84
GRASSES		
Bromus carinatus	2.00	4.59
Elymus spicatus	1.50	4.82
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**55.21**	**79.62**

*Based on drill seeding methods

Table 3-22: Revegetation Seed Mixture for the Rabbitbrush/Sagebrush Community at the Coal Hollow Project

	Rate** (# PLS/Ac)	Seeds/ft^2
SHRUBS		
*Artemisia nova**	0.20	4.16
*Artemisia tridentata**	0.10	5.74
Ceratoides lanata	3.00	3.79
Purshia tridentata	15.00	5.17
Symphoricarpos oreophilus	3.00	5.17
FORBS* **		
Achillea millefolium	0.03	1.91
Hedysarum boreale	5.00	3.86
Linum lewisii	0.70	4.47
Lupinus argenteus	15.00	4.30
Penstemon palmeri	0.30	4.20
Sphaeralcea grossulariifolia	0.40	4.59
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**47.23**	**75.60**

* This species could also to be planted by containerized seedlings at a rate of 200 plants per acre to enhance sage-grouse habitat.

** Based on drill seeding methods

*** Seeds used may be based on commercial availability. Other forb species that would be beneficial for sage-grouse enhancement include: *Achillea millefolium, Agoseris glauca, Crepis acuminata, Gayophytum spp., Lomatium spp., Tragopogon dubius, Trifolium spp.*

341.220. Planting & Seeding Methods

Seedbed Preparation & Analyses

The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil in the same order it existed prior to removal by the mining activities. Next, a basic soil sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed may include:

- Electrical conductivity (EC)
- Sodium adsorption ratio (SAR)
- pH
- Texture
- Organic matter
- Available phosphorus (P)
- Potassium (K)
- Nitrate

If heavy equipment results in soil compaction at the surface of the reclaimed areas, they will then be ripped, disked, and harrowed to loosen the seedbed prior to seeding. In other areas where less compaction has occurred, the areas will be disked and harrowed. The disking and harrowing of all areas will be done parallel with the contour wherever possible to decrease the potential for water erosion downslope. In other areas where compaction is not a problem, dozer tracking can be used to roughen the surface, and to trap seed, fertilizer, mulch, and other amendments as well as decrease erosion by wind and water. In such cases seeding will be done immediately after this treatment, whereas soil amendments, where required, would be applied over the surface during seedbed preparations.

In some of the more sloped areas that will be reclaimed to the native plant community, "roughening" or "gouging" may also be employed. The gouges would be depressions created at the surface with dimensions of approximately 1.5 ft (d) x 3 ft (l) x 3 ft (w).

Seeding & Transplanting

Seeding will be accomplished using different methods depending on the area to be seeded. In the more flat areas such as the meadows and existing pasture lands, a typical farmland drill will be used for seeding. In other areas where the surface may be more rough, a modified rangeland drill or "rough terrain seeder" will be used. Finally, in the areas where access is more difficult to reach by heavy equipment due to slope steepness or other limiting factors, broadcast seeding or hydro-seeding will be employed. For a list of plant species to be seeded refer to Tables 3-17 *through* 3-22.

Containerized plants will be planted in those areas proposed for sage-grouse habitat

enhancement. These plants will be planted from containers at least 10 cubic inches in size and inoculated with appropriate site-specific or commercial mycorrhizal inocula at specified infection rates. The containerized plants will be planted at a rate that totals at least 400 individuals per acre. For a list of the species to be planted, refer to Table 3-17.

Containerized plants should be dormant when they arrive at the site in the spring or fall and will be planted as soon after delivery as possible. Plants will be planted in a fashion to simulate a natural habitat. If competing vegetation is present at the time of planting, this vegetation will be removed by scalping the area or herbicide application beforehand that provide a time period ample as to not affect the containerized seedling. A small depression will be created in the seedbed around the seedling at the time of planting to increase survivability by harvesting and holding water. The plants will be "watered-in" when they are planted by adding water to the depression. If possible, the plants will be watered during dry periods for the first growing season.

341.230. Mulching Techniques

Mulch will be placed on the seedbed surface once soil amendments have been incorporated and seeding has been accomplished in areas that will be reclaimed to native plant communities (areas used for pasture lands will not be mulched). The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Like the seeding methods, mulch will be applied with a variety of techniques and materials depending on the reclaimed area.

Certified weed-free *straw* will be used in those areas where drill seeding has been employed at a rate of 1 ton/acre. The straw will be crimped or otherwise held to the surface by tackifier or plastic mesh stapled to the ground.

In those areas where broadcast seeding is employed, straw or *hydro-mulch* may be used. In other areas where hydro-seeding is employed, hydro-mulching will also be done. In such cases, seed and mulch will be applied as separate applications, with seeding accomplished first. The mulch will be held to the surface by an effective tackifier that is added to the slurry mix prior to application.

Finally, in areas that need extra protection due to steepness of slope or where soils are especially erodible, erosion control mat will be utilized. Several excellent materials are available and will be applied at the manufactures recommended rates.

341.240. Irrigation

Irrigation has not been planned for the reclaimed area with the exception of watering the containerized plants as mentioned above.

341.250. Revegetation Monitoring

Vegetation of the reclaimed areas will be monitored regularly to measure the success of plant establishment and to determine if problem areas exist. Qualitative and quantitative data will be recorded at regular intervals. The qualitative data will include: site location, sample date, observers, slope, exposure, acreage, animal disturbance, erosion damage, dominant plant species observed, and other pertinent notes. Quantitative data recorded will include: total cover (living cover, rock, litter, bare ground), cover by species, composition, frequency, and woody species density.

Methods for quantitative monitoring will be as follows. Transect lines will be placed randomly on each of the revegetation sites. Random sample locations will then be placed from these transect lines and the aforementioned data will be recorded. Ocular methods with square meter quadrat will be used to provide cover and frequency data, whereas, point quarter and/or belt transects will be used to estimate woody species densities.

341.300. Mining, Reclamation & Revegetation Research

Mining, reclamation & revegetation research has been planned and is in the process of being submitted to DOGM. Additionally, DOGM may require greenhouse studies, field trials, or equivalent methods of testing proposed or potential revegetation materials and methods to demonstrate that revegetation is feasible pursuant to R645-300-133.710.

342. FISH AND WILDLIFE ENHANCEMENT

This application includes a fish and wildlife plan for the reclamation and postmining phase of the operation consistent with R645-301-330, the performance standards of R645-301-358 and include the following (for details see section 330, OPERATION PLAN).

342.100. Measures for Enhancement of Habitat

Enhancement measures that will be used during the reclamation and postmining phase of the operation to develop aquatic and terrestrial habitat. Such measures may include restoration of streams and other wetlands, retention of ponds and impoundments, establishment of vegetation for wildlife food and cover, and the replacement of perches and nest boxes (see also section 330, OPERATION PLAN).

342.200. Reclamation Plants for Enhancement

Where fish and wildlife habitat is to be a postmining land use, the plant species to be used on reclaimed areas have been selected on the basis of the criteria described below.

342.210. Nutritional Values of Plant Species

Among other qualities (e.g. erosion control qualities, establishment capabilities, and seed availability), plant species for revegetation of the Coal Hollow Project have been chosen for their proven nutritional value for wildlife (see Table 3-17 *through* 3-22).

342.220. Cover Quality of Plant Species

Among other qualities (e.g. erosion control qualities, establishment capabilities, and seed availability), plant species for revegetation of the Coal Hollow Project have been chosen for their cover qualities for wildlife (see Table 3-17 *through* 3-22).

342.230. Habitat Enhancement & Plant Species

Among other qualities, plant species for revegetation of the Coal Hollow Project have been chosen for their proven habitat enhancement qualities for wildlife (see Table 3-17 *through* 3-22). The plants have also been chosen for their ability to support and enhance fish or wildlife habitat after the release of performance bonds. At final revegetation, the selected plants will be grouped and distributed in a manner which optimizes edge effect, cover, and other benefits to fish and wildlife.

After consultation with appropriate agencies and biologists regarding habitats and sensitive species, the sage-grouse and its habitat were of greatest concern in the area. There has been a decreasing trend in the populations of this species since 1964 (see **Appendix 3.1** and **Appendix 3-3** for more details). There was a general consensus among the biologists and agencies

consulted that due to the: 1) marginal habitat in the Alton Amphitheater area, 2) loss of habitat in recent years for nesting and brood-rearing and 3) relatively low population numbers in the area, that the local population of sage-grouse is vulnerable to elimination, regardless of mining activities proposed by the Coal Hollow Project. Accordingly, the several measures to minimize impacts and enhance habitat for this species have been proposed and are subject to further consideration by the operator and regulatory agencies (see Section 333 above).

342.300. Cropland & Revegetation

Where cropland is to be the postmining land use, where appropriate for wildlife- and crop-management practices, and with approval from the private landowners, the Coal Hollow Project will intersperse the fields with trees, hedges, or fence rows throughout the harvested area to break up large blocks of monoculture and to diversify habitat types for birds and other animals.

342.400. Residential & Industrial Reclamation

Where residential, public service, or industrial uses are to be the postmining land use, and where consistent with the approved postmining land use, the Coal Hollow Project will intersperse reclaimed lands with greenbelts utilizing species of grass, shrubs, and trees useful as food and cover for wildlife. No residential or industrial areas have been planned at this time.

350. PERFORMANCE STANDARDS

351. GENERAL REQUIREMENTS

All coal mining and reclamation operations will be carried out according to plans provided under R645-301-330 *through* R645-301-340.

352. CONTEMPORANEOUS RECLAMATION

Revegetation on all land that is disturbed by coal mining and reclamation operations, will occur as contemporaneously as practicable with mining operations, except when such mining operations are conducted in accordance with a variance for combined Surface and Underground Coal Mining and Reclamation Activities issued under R645-302-280. DOGM may establish schedules that define contemporaneous reclamation.

353. REVEGETATION: GENERAL REQUIREMENTS

Operators of the Coal Hollow Project will establish on re-graded areas and on all other disturbed areas, except water areas and surface areas of roads that are approved as part of the postmining land use, a vegetative cover that is in accordance with the mine permit and reclamation plan.

353.100. Vegetative Plant Cover Qualities

353.110. Diverse, Effective, & Permanent

The vegetation cover established at final reclamation will be diverse, effective and permanent.

353.120. Native Plant Species

The cover will be comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use and approved by the DOGM (see Tables 3-17 *through* 3-22).

353.130. Final Vegetation Cover & Quantities

The final cover will be at least equal in extent of cover to the natural vegetation of the area, or those standards set for final revegetation success.

353.140. Vegetation Cover and Soil Stabilization

The cover will be capable of stabilizing the soil surface from erosion.

353.200. The reestablished plant species will also contain the qualities listed below.

353.210. (a) Be compatible with the approved postmining land use.

353.220. (b) Have the same seasonal characteristics of growth as the original vegetation.

353.230. ©) Be capable of self-regeneration and plant succession.

353.240. (d) Be compatible with the plant and animal species of the area.

353.250. (e) Meet the requirements of applicable Utah and federal seed, poisonous and noxious plant; and introduced species laws or regulations.

353.300. Vegetative Cover Exceptions

DOGM may grant exception to the requirements of R645-301-353.220 and R645-301-353.230 when the species are necessary to achieve a quick-growing, temporary, stabilizing cover, and

measures to establish permanent vegetation are included in the approved permit and reclamation plan.

353.400. Cropland Exceptions

When the approved postmining land use is cropland, DOGM may grant exceptions to the requirements of R645-301-353.110, R645-301-353.130, R645-301-353.220 and R645-301-353.230.

354. TIMING OF REVEGETATION

Disturbed areas will be planted during the first normal period for favorable planting conditions after replacement of the plant-growth medium. The normal period for favorable planting is that planting time generally accepted locally for the type of plant materials selected (see section 341.100, Reclamation Timetable).

355. MULCHING & OTHER SOIL STABILIZING PRACTICES FOR REVEGETATION

Suitable mulch and other soil stabilizing practices will be used on all areas that have been re-graded and covered by topsoil or topsoil substitutes (see section 340, RECLAMATION PLAN).

356. STANDARDS FOR REVEGETATION SUCCESS

356.100. Success Criteria

Success of revegetation will be judged on the effectiveness of the vegetation for the approved postmining land use, the extent of cover compared to the extent of cover of the reference area or other approved success standard, and the general requirements of R645-301-353.

356.110. Vegetation Information Guidelines

Standards for success, statistically valid sampling techniques for measuring success, and approved methods are identified in the DOGM's "Vegetation Information Guidelines, Appendix A." The approved techniques in that document will be used for the Coal Hollow Project.

As stated above, the reclaimed plant communities at the site will be diverse, permanent, capable of stabilizing the soil surface for erosion, and will be compatible with the postmining land use. The reclaimed areas will be compared to the reference areas. Methods to be employed to determine that the standards have been met follow:

Cover Ocular methods by meter square quadrats.

Shrub Density Point quarter method and/or belt transects

Frequency Relative number of times that it occurred in the square meter quadrats.

Production Total annual biomass production will be estimated by clipping, drying and weighing current annual growth. Herbaceous and woody species will be summarized separately. "Double sampling" using four quadrats will be estimated around the clipped plots.

Diversity Diversity will be measured by several methods. The average number of vascular species per meter square quadrat will be obtained by summing the frequency of all species in an area and dividing by 100.

Another diversity measurement will be species richness or simply the total number of species encountered in the quadrats for each area.

Finally, total diversity will be measured by using the MacArthur and Wilson's (1967) formula where the proportion of the sum frequency of each species of an area was calculated. The proportion of each species will be squared and the values for all species in the area are to be summed. This index integrates the number of species encountered and the degree to which frequency of occurrence is equitably distributed among those species. The formula is given below:

$$Total\ Diversity = \frac{1}{\sum P_i^2}$$

where,

P_i = the proportion of the sum frequency for a community contributed by the i^{th} species.

356.120. Revegetation Success Standards

Standards for revegetation success will include comparisons of unmined lands (reference areas) with the areas being reclaimed to evaluate the appropriate vegetation parameters of ground cover, production, or stocking. Ground cover, production, or stocking will be considered equal to the approved success standard when they are not less than 90 percent of the success standard. The sampling techniques for measuring success will use a 90-percent statistical confidence interval (i.e., one-sided test with a 0.10 alpha error).

356.200. Postmining Land Use

Standards for success will be applied in accordance with the approved postmining land uses (see Chapter 4).

356.210. Grazing or Pasture Land

Some areas will be reclaimed as pasture and grazing land (see *Vegetation Map*, Drawing 3-1 and Drawing 3-1b). For these and other areas determined by the landowners, the ground cover and production of living plants on the revegetated area will be at least equal to that of a reference area or other success standards approved by DOGM.

356.220. Cropland

For areas developed for use as cropland, crop production on the revegetated area will be at least equal to that of a reference area or such other success standards approved by DOGM. The requirements of R645-302-310 through R645-302-317 apply to areas identified as prime farmland (*no areas have been identified as prime farmland in the Coal Hollow Project Area*).

356.230. Wildlife Habitat

Several areas will be returned to wildlife habitat. For these areas success of vegetation will be determined on the basis of tree and shrub stocking and vegetative ground cover (see also section 356.100, Success Criteria).

356.231. Consultation & Approval

Minimum stocking and planting arrangements will be specified by DOGM on the basis of local and regional conditions and after consultation with and approval by Utah agencies responsible for the administration of forestry and wildlife programs. Consultation and approval will be on a permit specific basis.

356.232. Woody Species Success Criteria

Trees and shrubs that will be used in determining the success of stocking and the adequacy of plant arrangement will have utility for the approved postmining land use. At the time of bond release, such trees and shrubs will be healthy, and at least 80 percent will have been in place for at least 60 percent of the applicable minimum period of responsibility. No trees and shrubs in place for less than two growing seasons will be counted in determining stocking adequacy.

356.233. General Vegetative Cover

Vegetative ground cover will not be less than that required to achieve the approved postmining land use.

356.240. Industrial, Commercial or Residential Success Criteria

For areas to be developed for industrial, commercial, or residential use less than two years after regrading is completed, the vegetative ground cover will not be less than that required to control erosion. At this time, no areas have been proposed to be reclaimed as industrial, commercial or residential for the Coal Hollow Project.

356.250. Previous Disturbed Areas Success Criteria

For areas previously disturbed by mining that were not reclaimed to the requirements of R645-200 through R645-203 and R645-301 through R645-302 and that are re-mined or otherwise redisturbed by coal mining and reclamation operations, at a minimum, the vegetative ground cover will be not less than the ground cover existing before redisturbance and will be adequate to control erosion. Other than those lands where the native plant communities have been disturbed for rangeland improvements or pasture lands, no areas would be considered "previously disturbed" in the project area.

356.300. Sediment Control Structures

Siltation structures will be maintained until removal is authorized by the DOGM and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.

356.400. Removal of Sediment Control Structures

When a siltation structure is removed, the land on which the siltation structure was located will be revegetated in accordance with the reclamation plan and R645-301-353 *through* R645-301-357.

357. REVEGETATION RESPONSIBILITY PERIODS

357.100. Beginning Date

The period of extended responsibility for successful vegetation will begin after the last year of augmented seeding, fertilization, irrigation, or other work, excluding husbandry practices that are approved by DOGM in accordance with paragraph R645-301-357.300.

357.200. Duration

Vegetation parameters identified in R645-301-356.200 will equal or exceed the approved success standard during the growing seasons for the last two years of the responsibility period. The period of extended responsibility will continue for five or ten years based on precipitation data reported pursuant to R645-301-724.411 based on the following conditions.

357.210. (a). In areas of more than 26.0 inches average annual precipitation, the period of responsibility will continue for a period of not less than five full years.

357.220. (b). In areas of 26.0 inches or less average annual precipitation, the period of responsibility will continue for a period of not less than ten full years.

357.300. Husbandry Practices

357.301. Approval Information

DOGM may approve certain selective husbandry practices without lengthening the extended responsibility period. Practices that may be approved are identified in R645-301-357.310 *through* R645-301-357.365. The operator may propose to use additional practices, but they would need to be approved as part of the Utah Program in accordance with 30 CFR 732.17. Any practices used will first be incorporated into the mining and reclamation plan and approved in writing by DOGM. Approved practices are normal conservation practices for unmined lands within the region which have land uses similar to the approved postmining land use of the disturbed area. Approved practices may continue as part of the postmining land use, but discontinuance of the practices after the end of the bond liability period will not jeopardize permanent revegetation success. Augmented seeding, fertilization, or irrigation will not be approved without extending the period of responsibility for revegetation success and bond liability for the areas affected by said activities and in accordance with R645-301-820.330.

357.302. Demonstration of Appropriate Reclamation Techniques

The Coal Hollow Project will demonstrate that husbandry practices proposed for a reclaimed area are not necessitated by inadequate grading practices, adverse soil conditions, or poor reclamation procedures.

357.303. Bonded Area & Husbandry Practices

DOGM will consider the entire area that is bonded within the same increment, as defined in R645-301-820.110, when calculating the extent of area that may be treated by husbandry practices.

357.304. Separate Responsibility Periods

If it is necessary to seed or plant in excess of the limits set forth under R645-301-357.300, DOGM may allow a separate extended responsibility period for these reseeded or replanted areas in accordance with R645-301-820.330.

357.310. Reestablishing Trees and Shrubs

357.311. Planting Within the Responsibility Period

Trees or shrubs may be replanted or reseeded at a rate of up to a cumulative total of 20% of the required stocking rate through 40% of the extended responsibility period.

357.312. Planting Shrubs in Established Vegetation

If shrubs are to be established by seed in areas of established vegetation, small areas will be scalped (see section 341.220, Planting & Seeding Methods). The number of shrubs to be counted toward the tree and shrub density standard for success from each scalped area will be limited to one.

357.320. Weed Control and Associated Revegetation

Weed control through chemical, mechanical, and biological means discussed in R645-301-357.321 *through* R645-301-357.323 may be conducted through the entire extended responsibility period for noxious weeds and through the first 20% of the responsibility period for other weeds. Any revegetation necessitated by the following weed control methods will be performed according to the seeding and transplanting parameters set forth in R645-301-357.324.

357.321. Chemical Weed Control

Weed control through chemical means will follow the current Weed Control Handbook (published annually or biannually by the Utah State University Cooperative Extension Service) and herbicide labels.

357.322. Mechanical Weed Control

Mechanical practices that may be approved include hand roguing, grubbing and mowing.

357.323. Biological Weed Control

Selective grazing by domestic livestock may be used by the Coal Hollow Project. Biological control of weeds through disease, insects, or other biological weed control agents is allowed but will be approved on a case-by-case basis by DOGM, and other appropriate agency or agencies which have the authority to regulate the introduction and/or use of biological control agents.

357.324. Weed Control & Desirable Species Damage

Where weed control practices damage desirable vegetation, areas treated to control weeds may be reseeded or replanted according to the following limitations. Up to a cumulative total of 15% of a reclaimed area may be reseeded or replanted during the first 20% of the extended responsibility period without restarting the responsibility period. After the first 20% of the responsibility period, no more than 3% of the reclaimed area may be reseeded in any single year without restarting the responsibility period, and no continuous reseeded area may be larger than one acre. Furthermore, no seeding will be done after the first 60% of the responsibility period or Phase II bond release, whichever comes first. Any seeding outside these parameters will be considered to be "augmentative seeding," and will restart the extended responsibility period.

357.330. Control of Other Pests

357.331. Big Game

Control of big game (deer, elk, moose, antelope) may be used only during the first 60% of the extended responsibility period or until Phase II bond release, whichever comes first. Any methods used will first be approved by DOGM and, as appropriate, the land management agency and the State of Utah Division of Wildlife Resources (DWR). Methods that may be used include fencing and other barriers, repellents, scaring, shooting, and trapping and relocation. Trapping and special hunts or shooting will be approved by DWR. Other control techniques may be allowed but will be considered on a case-by-case basis by the DOGM and by DWR. Appendix C of the DOGM's "Vegetation Information Guidelines" includes a non-exhaustive list of publications containing big game control methods.

357.332. Small Mammal & Insects

Control of small mammals and insects will be approved on a case-by-case basis by DWR and/or the Utah Department of Agriculture. The recommendations of these agencies will also be approved by the appropriate land management agency or agencies. Small mammal control will be allowed only during the first 60% of the extended responsibility period or until Phase II bond release, whichever comes first. Insect control will be allowed through the entire extended responsibility period if it is determined, through consultation with the Utah Department of Agriculture or Cooperative Extension Service, that a specific practice is being performed on adjacent unmined lands.

357.340. Natural Disasters and Illegal Activities Occurring After Phase II Bond Release

Where necessitated by a natural disaster, excluding climatic variation, or illegal activities, such as vandalism, not caused by any lack of planning, design, or implementation of the mining and reclamation plan on the part of the Coal Hollow Project, the seeding and planting of the entire area which is significantly affected by the disaster or illegal activities will be allowed as an accepted husbandry practice and thus will not restart the extended responsibility period. Appendix C of the Division's "Vegetation Information Guidelines" references publications that show methods used to revegetate damaged land. Examples of natural disasters that may necessitate reseeding which will not restart the extended responsibility period include wildfires, earthquakes, and mass movements originating outside the disturbed area.

357.341. Extent of Area

The extent of the area where seeding and planting will be allowed will be determined by the DOGM in cooperation with the Coal Hollow Project.

357.342. Standards of Success

All applicable revegetation success standards will be achieved on areas reseeded following a disaster, including R645-301-356.232 for areas with a designated postmining land use of forestry or wildlife.

357.343. Seeding & Planting in Phase II Areas

Seeding and planting after natural disasters or illegal activities will only be allowed in areas where Phase II bond release has been granted.

357.350. Irrigation

The irrigation of transplanted trees and shrubs, but not of general areas, is allowed by DOGM through the first 20% of the extended responsibility period. Irrigation may be by such methods as, but not limited to, drip irrigation, hand watering, or sprinkling.

357.360. Highly Erodible Area and Rill and Gully Repair

The repair of highly erodible areas and rills and gullies will not be considered an augmentative practice, and will thus not restart the extended responsibility period, if the affected area as defined in R645-301-357.363 comprises no more than 15% of the disturbed area for the first 20% of the extended responsibility period and if no continuous area to be repaired is larger than one acre.

357.361. Highly Erodible Areas Responsibility Period

After the first 20% of the extended responsibility period but prior to the end of the first 60% of the responsibility period or until Phase II bond release, whichever comes first, highly erodible area and rill and gully repair will be considered augmentative, and will thus restart the responsibility period, if the area to be repaired is greater than 3% of the total disturbed area or if a continuous area is larger than one acre.

357.362. Extent of Area Affected

The extent of the affected area will be determined by the DOGM in cooperation with the Coal Hollow Project.

357.363. Definition of Highly Erodible Areas

The area affected by the repair of highly erodible areas and rills and gullies is defined as any area that is reseeded as a result of the repair. Also included in the affected areas are interspacial areas of thirty feet or less between repaired rills and gullies. Highly erodible areas are those areas which cannot usually be stabilized by ordinary conservation treatments and if left untreated can cause severe erosion or sediment damage.

357.364. Erodible Areas & Sediment Control

The repair and/or treatment of rills and gullies which result from a deficient surface water control or grading plan, as defined by the recurrence of rills and gullies, will be considered an augmentative practice and will thus restart the extended responsibility period.

357.365. Erodible Area Designs & Repairs

The Coal Hollow Project shall demonstrate by specific plans and designs the methods to be used for the treatment of highly erodible areas and rills and gullies. These will be based on a combination of treatments recommended in the Soil Conservation Service Critical Area Planting recommendations, literature recommendations including those found in Appendix C of the Division's "Vegetation Information Guidelines", and other successful practices used at other reclamation sites in the State of Utah. Any treatment practices used will be approved by the Division.

358. PROTECTION OF FISH, WILDLIFE AND RELATED ENVIRONMENTAL VALUES

The Coal Hollow Project will, to the extent possible using the best technology currently available, minimize disturbances and adverse impacts on fish, wildlife, and related environmental values and will achieve enhancement of such resources where practicable.

358.100. Threatened & Endangered Species

A review of the Utah Heritage Program database for sensitive species in the proposed mine site and adjacent areas has been accomplished. Field maps with locations of these species have been prepared and have been used for additional surveys and will continue to be in used in future biological studies or when disturbance by mining in specific areas is proposed.

Due to the sensitivity of these species, specific location information is considered confidential and has not been submitted in this application. However, review of this information can be arranged by the regulatory authorities (see section 322.200, Site-Specific Resource Information).

No coal mining and reclamation operation will be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary or which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973. The Coal Hollow Project will promptly report to the DOGM any state- or federally-listed endangered or threatened species within the permit area of which the operator becomes aware. Upon notification, DOGM will consult with appropriate state and federal fish and wildlife agencies and, after consultation, will identify whether, and under what conditions, the operator may proceed.

358.200. Eagles

The coal mining and reclamation operations at the Coal Hollow Project will not be conducted in a manner which would result in the unlawful taking of a bald or golden eagle, its nest, or any of its eggs. The operator of the Coal Hollow Project will promptly report to the DOGM any golden or bald eagle nest within the permit area of which the operator becomes aware. Upon notification, the DOGM will consult with the U.S. Fish and Wildlife Service (USFWS) and DWR and, after consultation, will identify whether, and under what conditions, the mining operations may proceed.

358.300. Removal of a Threatened & Endangered Species

No regulations in the R645 Rules authorizes the taking of an endangered or threatened species or a bald or golden eagle, its nest, or any of its eggs in violation of the Endangered Species Act of 1973 or the Bald Eagle Protection Act, as amended, 16 U.S.C. 668 et seq.

358.400. Riparian & Wetland Areas

There are some riparian and wetland areas associated with springs and seeps in the Coal Hollow permit area (see Chapter 7). At this time, the Coal Hollow Project plans to avoid disturbances to them, enhance them where practicable, and restore, or replace, wetlands and riparian vegetation along rivers and streams if disturbance to them it done.

Additionally, the coal mining and reclamation operations at the Coal Hollow Project will avoid disturbances to, enhance where practicable, or restore, habitats of unusually high value for fish and wildlife (see Section 333, Procedures to Minimize Adverse Impacts to Fish & Wildlife in this document).

358.500. Best Technology Available

The Coal Hollow Project will apply the best technology currently available in all disciplines of the coal mining and reclamation activities.

358.510. Powerline & Transmission Facilities

The Coal Hollow Project will ensure that electric powerlines and other transmission facilities used for, or incidental to, coal mining and reclamation operations on the permit area are designed and constructed to minimize electrocution hazards to raptors, except where DOGM determines that such requirements are unnecessary.

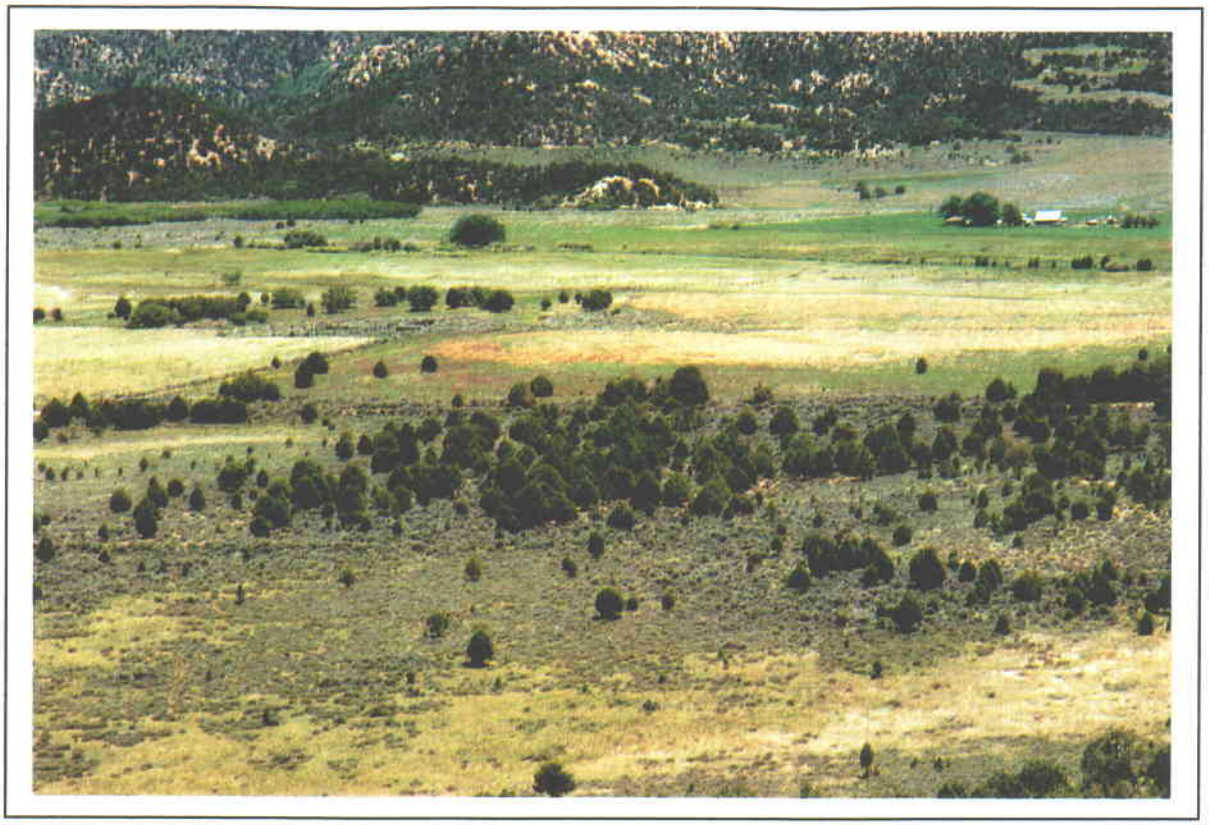
358.520. Fences & Conveyers

The Coal Hollow Project will design fences, overland conveyers, and other potential barriers to permit passage for large mammals, except where the DOGM determines that such requirements are unnecessary.

358.530. Toxic-Forming Areas

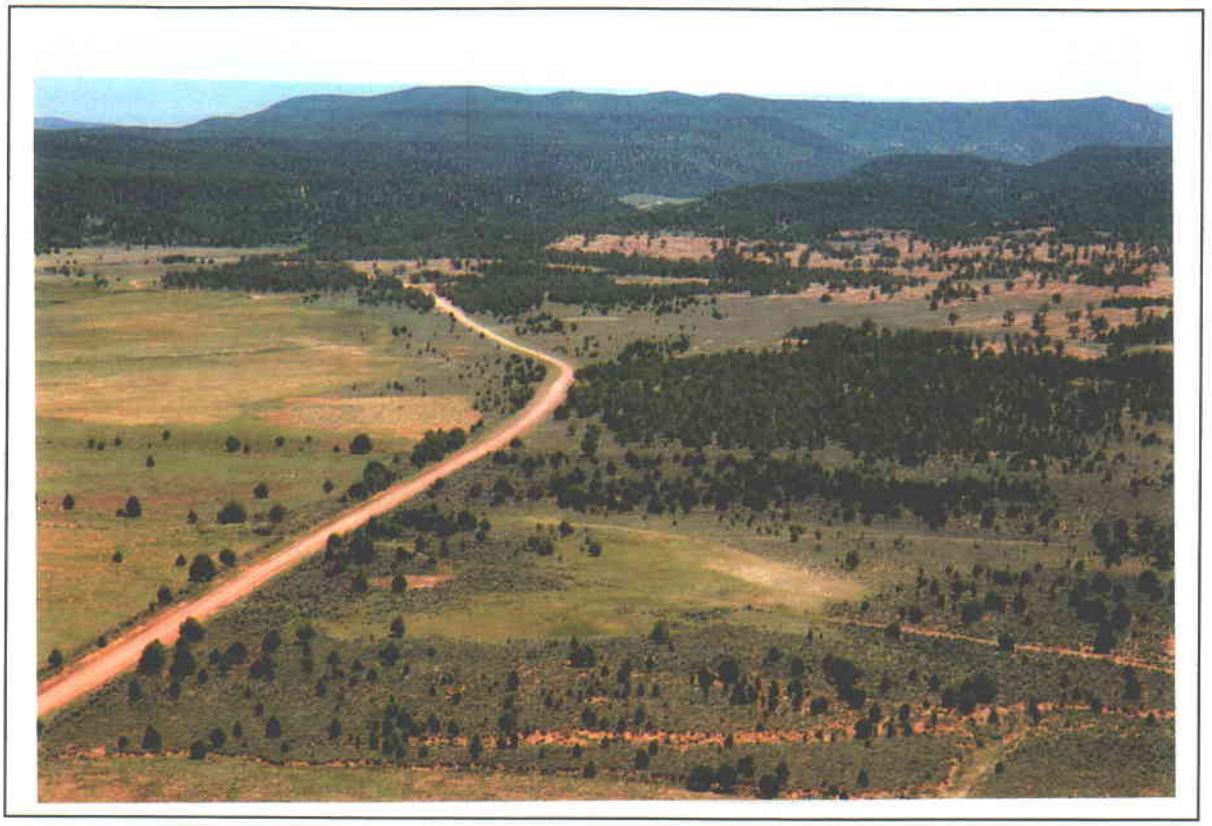
The Coal Hollow Project will fence, cover, or use other appropriate methods to exclude wildlife from ponds which contain hazardous concentrations of toxic-forming materials.

PHOTOGRAPHS



Photograph 3-1: Plant Communities of the Coal Hollow Project (General View; 1 of 3)

Photograph 3-2: Plant Communities of the Coal Hollow Project (General View; 2 of 3)



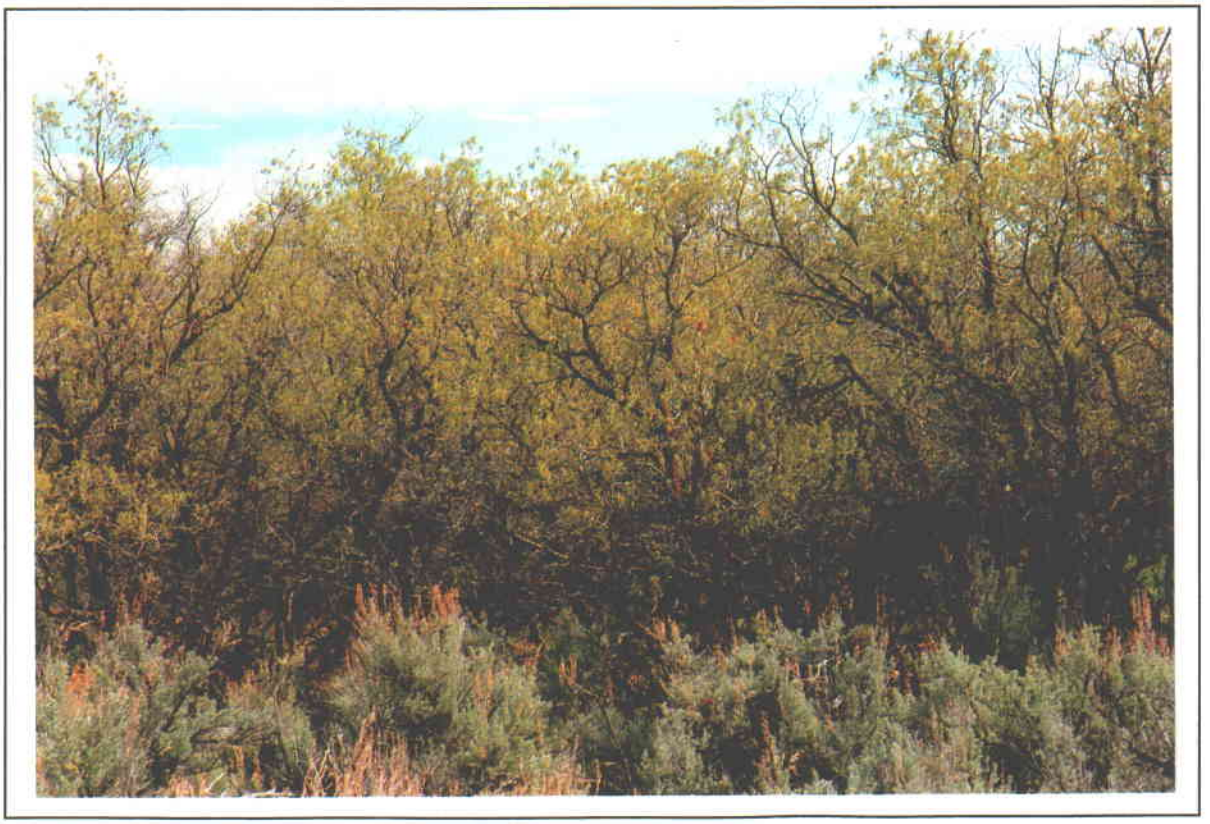
Photograph 3-3: Plant Communities of the Coal Hollow Project (General View; 3 of 3)

Photograph 3-4: Sagebrush Community of the Coal Hollow Project

Photograph 3-5: Meadow Community of the Coal Hollow Project

Photograph 3-6: Pasture Land Community of the Coal Hollow Project

Photograph 3-7: Pinyon-Juniper/Sagebrush Community of the Coal Hollow Project



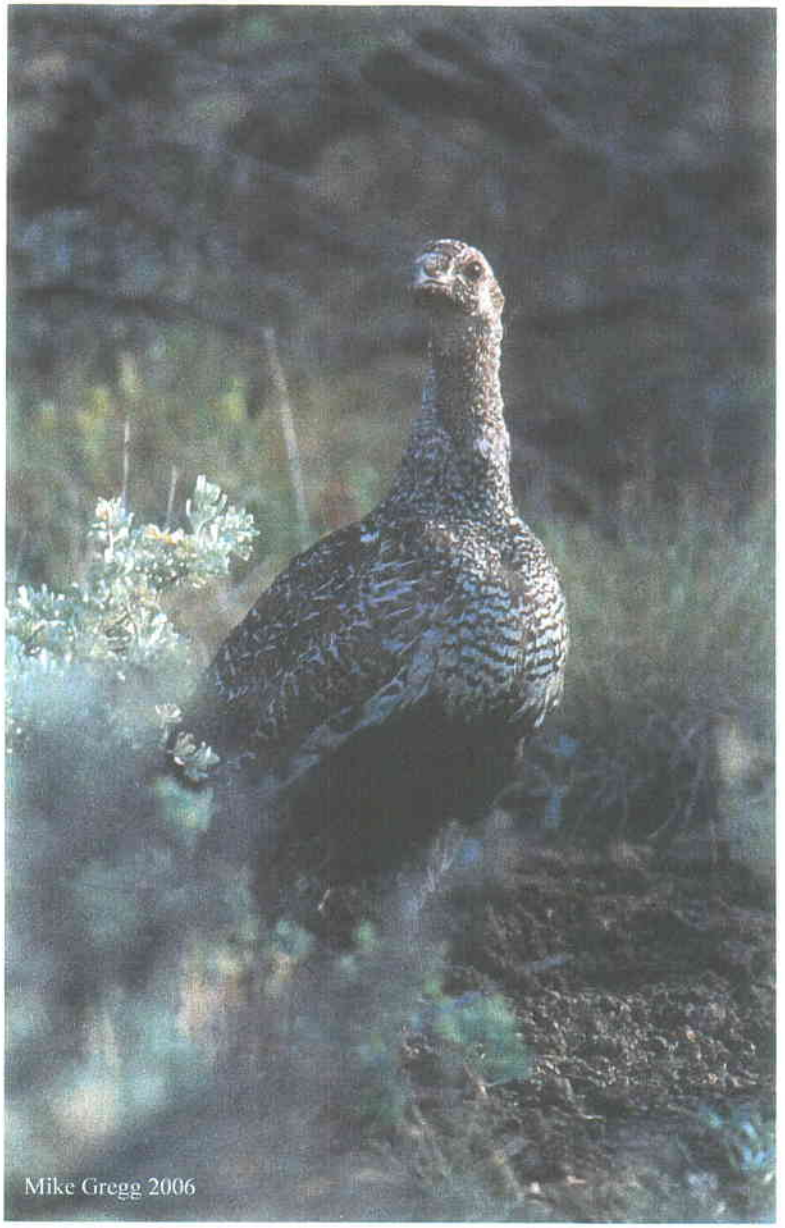
Photograph 3-8: Mountain Brush Community of the Coal Hollow Project

Photograph 3-9: Pinyon-Juniper/Mountain Brush Community of the Coal Hollow Project

Photograph 3-10: Pinyon-Juniper Woodland Community of the Coal Hollow Project

APPENDIX 3-1

ALTON SAGE-GROUSE HABITAT ASSESSMENT AND MITIGATION PLAN



Steven L. Petersen, Ph.D.

Alton, Utah Ecological Site Description

The town of Alton Utah (-112.474° longitude, 37.462° latitude), the Alton Amphitheater, and Sink Valley are located between the Pink Cliffs to the west and the Paunsaugunt plateau to the east (Figure 1). The town and surrounding valley occur within a larger watershed basin confined by steep side-slopes to shallow foothills. The soils in this area are high in clay content.

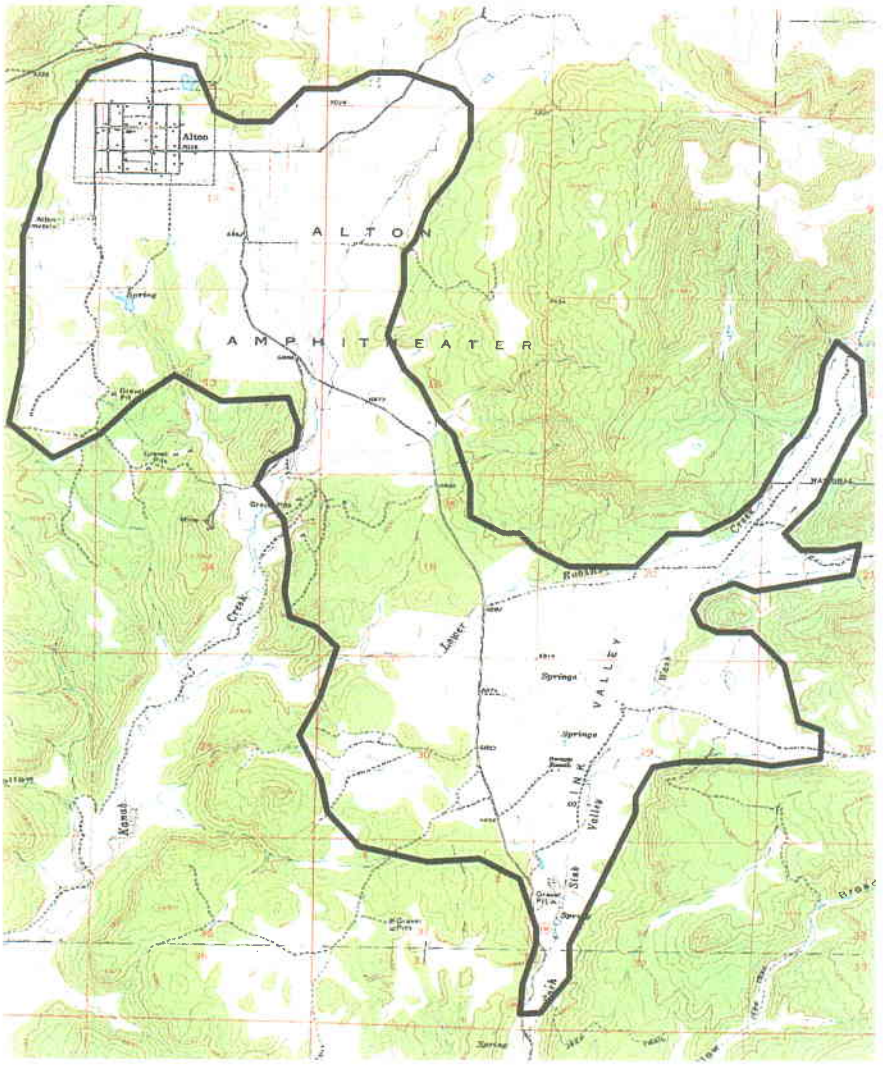


Figure 1. 7.5 minute topographic map of the Alton region. The black line delineates the zone where mining activity and mitigation will be concentrated.

Four predominant plant associations occur within the immediate Alton region (Figure 2). Plant associations are the pinyon – juniper dominated woodland area, the sagebrush dominated community, the valley floor grassland region, and irrigated croplands.

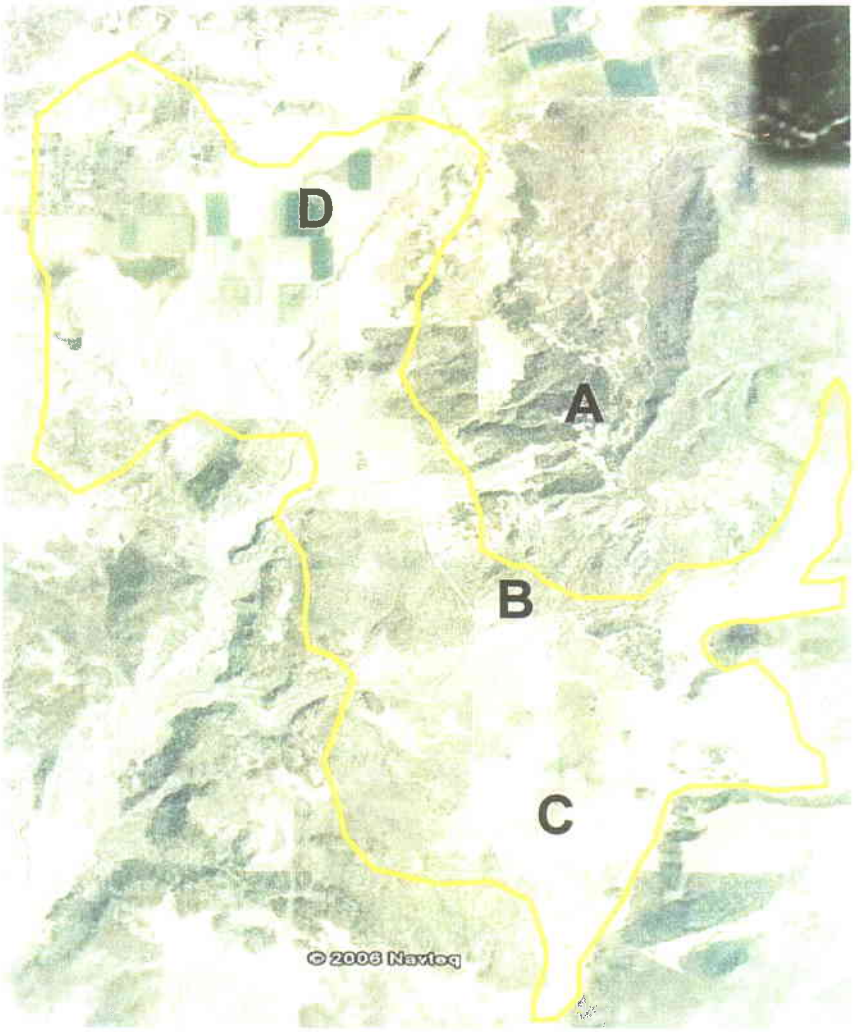


Figure 2. Satellite image of the Alton region (Google-earth 2006). The yellow line delineates the zone of mining activity and mitigation. Vegetation associations include A) Pinyon-juniper dominated woodlands, B) Sagebrush Communities, C) Valley-floor grasslands, and D) Irrigated cropland.

Pinyon-Juniper Dominated Woodlands

Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) dominated plant communities (PJ) occur widely throughout the Alton area, ranging from the

open valley floor to steep mountain slopes (Figure 3). Several shrub species that occur within these communities include big sagebrush (*Artemisia tridentata* var. *tridentata* and var. *vaseyana*), black sagebrush (*Artemisia nova*), and antelope bitterbrush (*Purshia tridentata*). Predominant grass species occurring in this region are bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), and needlegrass (*Stipa* species). There are a variety of forb species that can be found exhibiting a wide range in density and cover. Common forb species in these woodlands include tailcup lupine (*Lupinus caudatus*) and western yarrow (*Achillea millefolia*).

Figure 3. Juniper and pinyon dominated plant communities located throughout the Alton basin.

Juniper-dominated plant communities, which are transitional between lower elevation arable lands and higher elevation coniferous forests, serve an important ecological role providing seasonal areas for livestock grazing and wildlife habitat such as critical big game winter range (Roundy and Vernon 1999). Prior to European settlement, juniper and pinyon woodlands were primarily confined to shallow rocky soil slopes underlain by fractured bedrock (Miller and Wigand 1994, Miller and Rose 1995). Before this woodland encroachment occured, plant communities were dominated by short and tall sagebrush species, grasslands, riparian zones, and quaking aspen parklands (Burkhardt and Tisdale 1969, Miller et al. 2000, Bates et al. 1999).

Today, juniper and pinyon encroached ecosystems that occur throughout the Intermountain West have increased 10 fold from 1.5 million hectares to 15 million hectares (Miller et al. 2001). This expansion of PJ woodlands has increased as a result of fire suppression (e.g. reduced fire frequency), climate change, heavy grazing, or any combination of these factors (Eddleman 1983). As a result, juniper has moved into more productive, deeper, and well-drained soils from where they historically had been excluded (Burkhardt and Tisdale 1969, Miller and Rose 1995, West et al. 1978). Within the Alton area, most trees have expanded into the foothills and valley bottoms within the past century. This is noted by the relatively young age class of most trees within the area (100-150 years old).

Juniper and pinyon, which are deep-rooted tree species, have the ability to extract water from a wide range of soil depths. Extending deep into groundwater reserves, these trees have been found to directly impact aquifer recharge. They have high transpiration rates, especially during the active growing season. Reports indicate that during peak growth rates, juniper trees will transpire between 30-40 gallons of water each day. Juniper and pinyon can intercept a significant proportion of the precipitation prior to reaching the soil surface. In Texas, for example, evapotranspiration by juniper accounted for 80-95% of the water loss from rangelands (Thurow and Taylor 1995), and in Oregon, western juniper intercepted up to 74% of the precipitation during any given storm event (Eddleman 1983).

Juniper trees are very competitive with other plant species for limited resources, in particular water. The rapid uptake of water by juniper and pinyon trees reduces the availability of water to shallower rooted plant species. In fully occupied juniper woodlands, shrub mortality is initially evident, followed by a decline in grass and forb density and cover (Figure 4). As a result, the intercanopy area will often experience a severe decrease in plant structure and diversity. This in turn exposes bare soil to raindrop impacts, accelerated erosion rates, decreasing infiltrations rates, and high sediment movement and deposition in runoff. Once fully occupied, fuel loads in juniper woodlands (i.e. shrubs, grasses, and other low-growing

vegetation) become limiting, preventing naturally occurring fire from spreading. This in turn can result in long periods without natural disturbance.

Figure 4. Juniper and pinyon dominated plant communities located 50m west of the country road between Alton and Sink Valley.

Sagebrush Communities

Sagebrush dominated plant communities occur along the foothills and intermittently throughout the valley bottom in the Alton area (Figure 5). These sites are dominated by moderate to tall growing shrub species. Similar to juniper encroached areas, dominant species include big sagebrush (*Artemisia tridentata* var. *tridentata* and var. *vaseyana*), black sagebrush (*Artemisia nova*), and antelope bitterbrush (*Purshia tridentata*). Similarly, common grasses and forbs include bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), and bottlebrush squirreltail (*Sitanion hystrix*).

Sagebrush dominated stands in the Alton area are limited in size and extent. Most sites that would have once sustained characteristic sagebrush dominated communities have been encroached by juniper. Under natural fire regiimes, sagebrush dominated communities have characteristic fire-return-intervals of approximately 30-37 years (Heyerdahl et al. In Press). Following fire, perennial grasslands establish rapidly until over time sagebrush plants establish and develop

to maturity. With an ignition source along with a buildup of fuels, fire will soon reoccur destroying plants and returning the system to an earlier seral community. With fire suppression in addition to rapid and far-reaching juniper dispersal, the fire-return-interval for many of these systems has increased to 75-150 years. As a result, juniper woodlands have expanded and sagebrush communities have decreased within this area since the 1990's.

Intact sagebrush stands provide important habitat for a variety of sagebrush obligate and sagebrush facultative bird and mammal species. Sage sparrow (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewers sparrow (*Spizells breweri*) are sagebrush dependant passerine species found throughout the sagebrush grassland biome. Pygmy rabbit (*Brachylagus idahoensis)* and greater sage-grouse are species dependant of contiguous stands of sagebrush communities for providing adequate habitat.

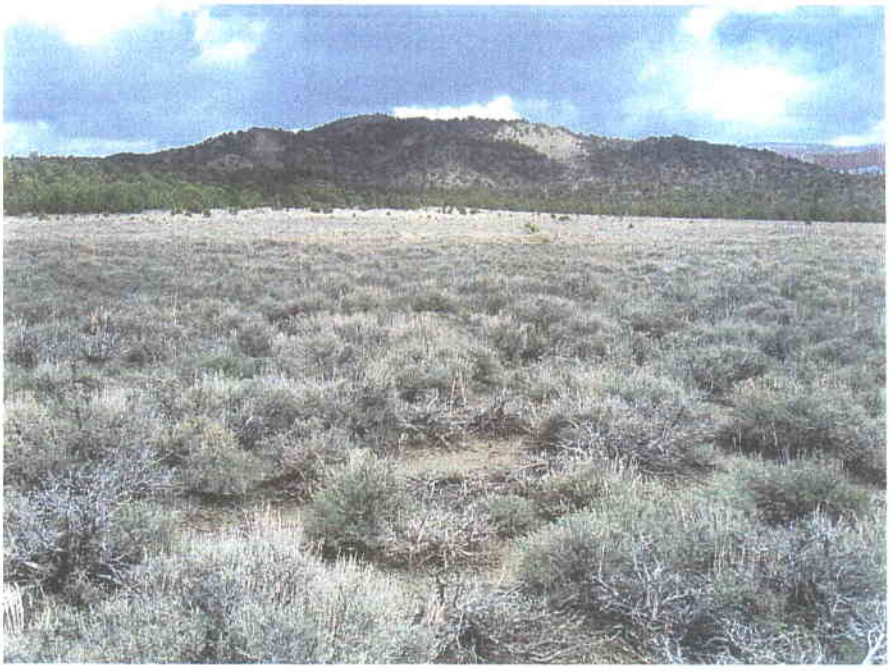


Figure 5. Sagebrush dominated plant communities located east of the country road north of Sink Valley.

Valley Floor Grasslands

Much of the valley bottoms in the Alton Amphitheater and Sink Valley areas are primarily pasture grasslands (Figure 6). These sites are dominated by grass and wet-meadow plant species that occur in fenced fields and pastures. During early spring months (March – April), surface water in the lower portions of this community type lead to ponding and surface flows (based on field observations between late March to early April). The grasses growing in these pastures are primarily introduced species, including Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pretense*), and intermediate wheatgrass (*Agropyron intermedium*). Sedge (*Carex*) species also occur in these fields, especially where water levels in the soil profile are high. Several forb species also grow in these fields including lomatium (*Lomatium* spp.), and wild iris (*Iris missouriensis*).

Figure 6. valley floor grassland communities that are dominated by pasture and fields consisting primarily of introduced grass species and native forbs. This photo was taken near the sage-grouse lek, adjacent to the Swapp Ranch house in Sink Valley.

Alton Land Use History

The Alton area has a long history of human occupation and use. Following the arrival of western civilization in this valley, the environment has undergone significant alterations.

Fire suppression and juniper expansion

Due to a prolonged history of fire prevention, this region has experienced an unnatural expansion of Utah juniper and pinyon pine along the mountain sides, foothills, and valley floor.

Crop and pasture production

Early settlers converted much of the low lying land into crop production and pasture development. Near Alton, a large portion of the land has been used for raising alfalfa hay. Irrigation has been utilized to sustain season-long hay production. Pastures extend across much of this valley for livestock and wildlife grazing. Pastures and crops have been separated by miles of fence that has been maintained for long time periods (Figure 7).

Sagebrush removal and disking

In many areas, especially south of Alton and north of Sink Valley, sagebrush was disked to remove the shrubs in order to open sites for grass establishment and growth. Introduced species seeded in these pastures included timothy, crested wheatgrass, intermediate wheatgrass and Kentucky bluegrass.

Irrigation and hydrologic modification

The original stream corridors and subsurface groundwater resources were used for irrigating crops and providing water to residents of the town. It is likely that original creek flow-paths have been significantly modified over time by farming and ranching operations.

Soil plowing and road-related disturbance

Based on current land conditions and practices, it is probable that much the soil in this area has been plowed for crop and pasture production. Where plowed, plowpans (compact soil layer) can occur which can restrict plant growth, root penetration and water infiltration. Equal to plowing, road construction has introduced a significant ecological disturbance to the area. These roads are used often, especially during the summer months by local citizens as well as tourists and other motorists. Roads provide ideal corridors for the spread of invasive plants.

City and Home Construction

The town of Alton occurs at the North end of the valley adjacent to the Alton Amphitheater. In addition to the town, a number of homes and ranches have been constructed throughout the Alton region extending to the southern end of the mining and mitigation zone. Activities associated with community life include farming, vehicle use, hunting, and other outdoor recreation and work related activities.

Figure 7. Ecological alterations to the Alton area apparent in this photo include fence construction, hay production, irrigation, road development, and juniper encroachment. This photo was taken east of Alton along the county road.

Sage-grouse Ecology

Population Dynamics

Sage-grouse (*Centrocercus urophasianus*) is a relatively long-lived bird species belonging to the pheasant family (*Phasanidea*). The average lifespan of an adult female is approximately 5-6 years, and less for males at 4-5 years. Sage-grouse vary in summer to winter migration from populations that travel only short distances throughout the year to other populations that will travel over 50 miles before returning to the lek the following spring.

Sage-grouse once occurred from Canada to New Mexico and east to the Dakotas. Today, the range in sage-grouse has decreased in both extent and population density. Figure 8 represents the level of change that has occurred since the settlement of western North America. Data indicate that since 1985, bird populations have decreased by 17-47%. Data provided by the USGS (2003) suggest that sage-grouse numbers have declined annually by 2% since the 1960's (Figure 9).

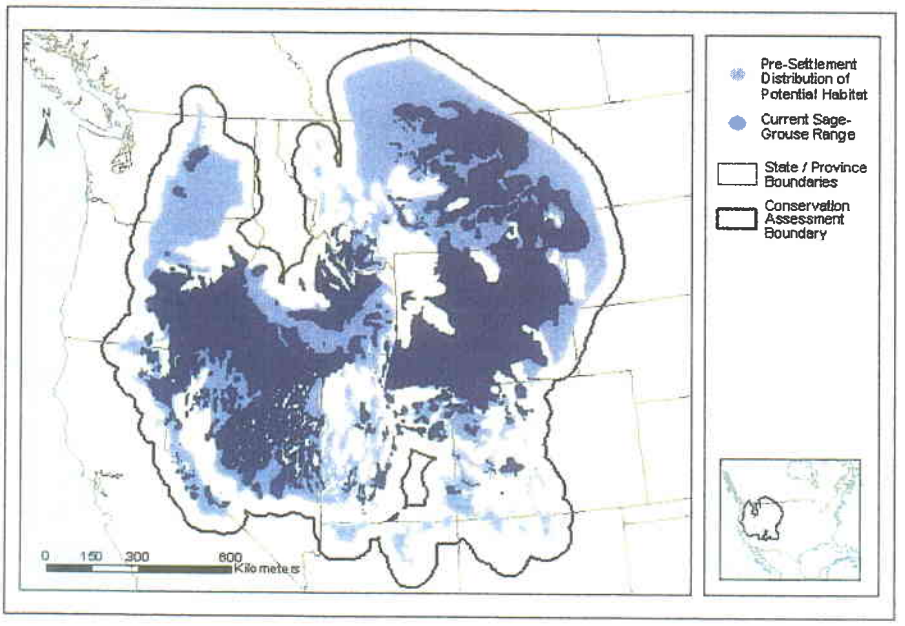


Figure 8. Range of sage-grouse during pre-settlement periods (light blue) in comparison with current sage-grouse populations. These data were provided by the USGS.

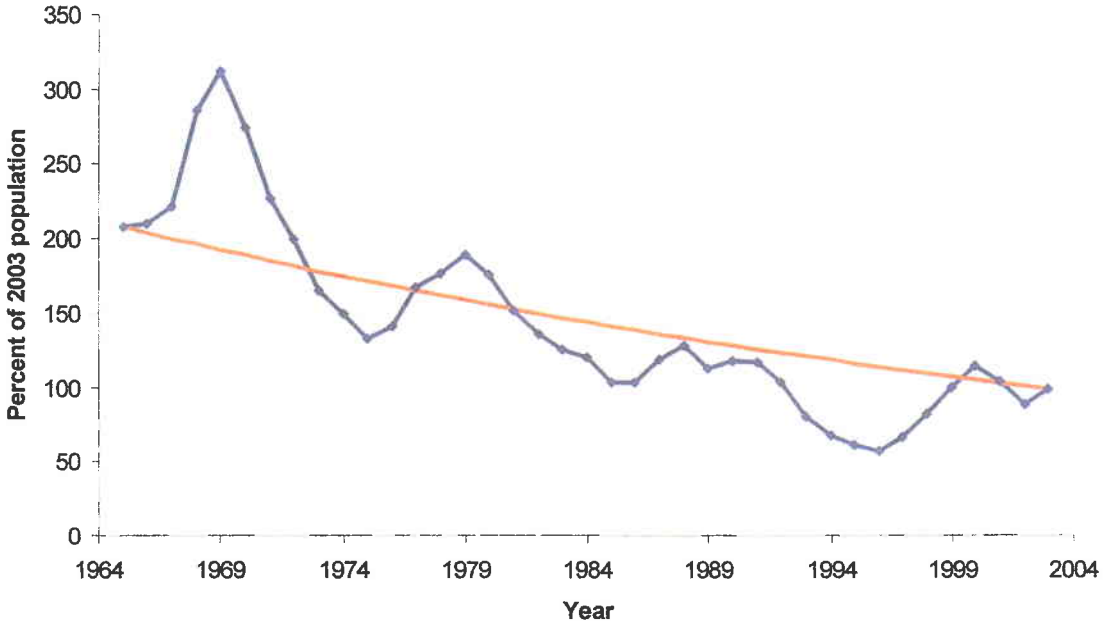


Figure 9. Trend in the sage-grouse population from 1964 to 2003. Data indicate an approximate 2% annual decline. 11 of the 13 states where sage-grouse occur have experienced long-term declines (USGS 2003).

The decline in sage-grouse breeding and nesting success, primarily during the last 50 years, has resulted in a reduction in the distribution of sage-grouse throughout North America by approximately 50% (Aldridge and Brigham 2002). This decrease has been attributed primarily to the reduction of suitable sagebrush habitat resulting from fragmentation, exotic weed invasion, conifer encroachment, overgrazing, cultivation, and altered fire regimes (Miller and Eddleman 2001, Pedersen et. al. 2003, Connelly et al. 2004). Currently, there is considerable discussion focused on strategies to maintain or restore the health of sage-grouse populations across the non-arable portions of the sagebrush biome. Researchers have begun to identify sage-grouse habitat attributes important for maintaining healthy populations throughout the year (Connelly et al. 2004, Crawford et al. 2004, Gregg et al.1994, Barnett and Crawford 1994).

Sage-grouse adult survival is relatively high which is reason for relatively stable adult populations from year to year. According to Connelly (2004), there is a 50-

75% annual survival rate for breeding-aged birds. Gregg (2006) found that female birds had on average 50-60% annual survival whereas male survival was lower (approx. 30%). Sage-grouse productivity, however, is low. Although adult birds may have high reproductive potential, hens will occasionally fail to attempt nesting or will attempt to nest, but fail in producing a viable clutch. More important however is the low juvenile survival rate. Low chick survival is attributed to predation, food and starvation, poor habitat, weather, and harvest. Periodically sage-grouse experience "boom years" in which bird production and survival is higher than average. During these years, populations can experience significant fluctuations in abundance.

Breeding and lek characteristics

Leks are confined areas where adult birds congregate for courtship and mating. From mid-March to late April, birds return to established lekking grounds where males exhibit elaborate courtship displays in attempt to attract observing females. Most adult birds, especially males, will return to the same lek year after year (Gregg et al. 1994). It is common for a lek to be revisited for many decades. Lek habitat consists of relatively short-growing vegetation that minimizes visual obstruction, necessary for performing and observing courtship displays and reducing predation from ground-based predators. Typical plant species that occur in leks are low sagebrush (*Artemisia arbuscula*) and low-growing grasses.

Examples of natural or artificial disturbances applied to a lek suggest that sage-grouse will tolerate modified conditions or will shift to alternate breeding sites. At Jackson Hole, Wyoming, observations of a lek located at the end of the local airport found that birds continued courtship and display behavior in spite of the disturbance of aircraft landing and taking off overhead. In northern Nevada, high water levels and snowpack on the lek during a single years breeding season resulted in the birds shifting breeding activities to a nearby alternate site located on an adjacent hillside. Finally, Tate et al. (1979) and Eng et al. (1979) found that when a lek was disturbed by mining activities, birds utilized a temporary artificial

alternate breeding ground. This shift was improved when audio recordings of strutting male grouse were played from audio equipment located in the alternate lek area.

Nesting and nest-site characteristics

For a 5-week period prior to nesting and after mating, birds move away from the lek and focus their attention on foraging. During this time, adult female birds eat 50-80% sagebrush leaves and 20-50% forbs (Connelly 2004). This provides an opportunity for the hens to acquire nutrients and body mass needed for maternal required during and following nesting.

Females establish nests primarily under mature sagebrush plants, often in mountain big sagebrush communities (Wallestad and Pyrah 1974). Nest sites generally occur within a couple miles of the lek, however, some birds may fly significant distances before establishing nest sites. Birds select nest sites based on canopy height and cover (Connelly 2004). Based on data collected from nest site locations, birds use stands that have on average 15-25% sagebrush cover and a minimum height of 40-80cm. Autenrieth (1981) suggests that poor reproductive success may result from a lack of key habitat structure. Delong (1994) also stated that nest failure can be caused by predation by coyotes, ravens and other small mammal and avian predators.

Post-nesting Habitat

After nesting, adult females and their brood will move to areas high in food resources, consuming mostly forbs and insects. For the first 2-3 weeks of their lives, chicks will consume almost entirely insect species, especially caterpillars, ants, and june beetles. Following this period, chicks modify foraging behavior mostly consuming a variety of forb species. As the season progresses, birds reach older and more developed growth stages, and simultaneously forb availability declines. Therefore, young birds will shift their diet toward sagebrush leaves, similar to diets of adult birds.

Winter Habitat

During late fall and into the winter, birds use medium to tall (25-80cm) sagebrush communities for hiding and foraging. Birds have been found to prefer south and west-facing slopes where air temperatures are greater during the day. During this time, birds forage almost exclusively on sagebrush leaves. Optimal sagebrush cover for winter habitat ranges between 12-43% (Connelly 2004).

Alton Sage-grouse population

Biologists from the Bureau of Land Management in Kanab, Utah captured, collared, and monitored 4 birds within a one year time period beginning in Spring 2005 (Church 2006). Based on these data, they found that the collared sage-grouse remain in the Alton area throughout their lifecycle, migrating only short distances between Sink Valley and the Alton Amphitheater.

Breeding Habitat

The only lek in the Alton area is approximately 100 yards west from the Swapp Ranch House (371533 Easting 4138811 Northing UTM Nad 27; Figure 10). The lek is located in a pasture that is enclosed by a juniper-post barb-wire fence.

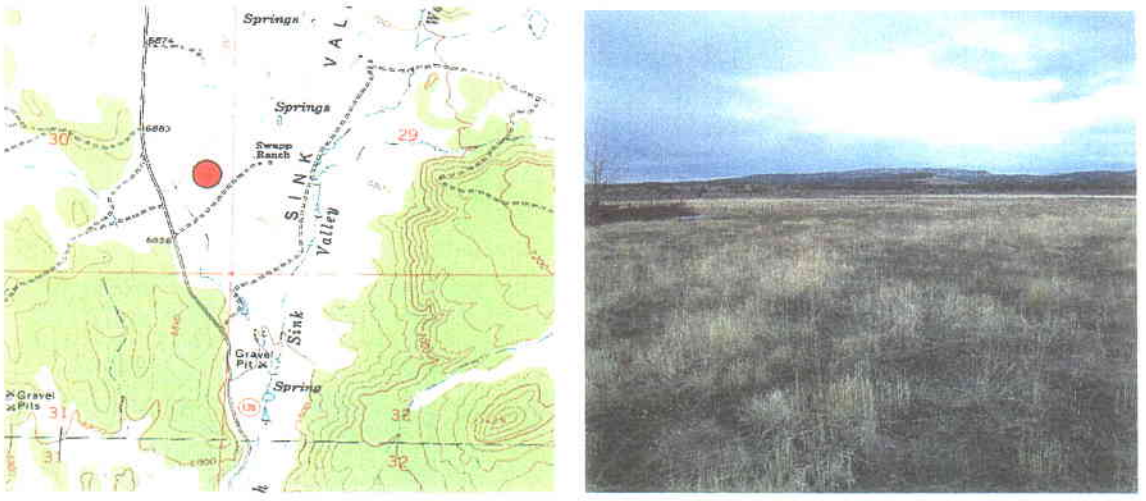


Figure 10. Location of the Sink Valley lek, located west of Swapp Ranch.

On March 30, 2006, 12 males and 4 females were observed on the lek between 6:30am to 8:00am. Adult males were observed displaying within 5-25 yards from the fence on the north-side of the pasture (Figure 11). Studies indicate that female to male ratios generally range between 1:1.5 to 1:2 birds. Therefore, the predicted number of female sage-grouse in the Alton area ranges between 18 and 24 birds and the total number of sage-grouse in the population is approximately 30-36 birds. Compared to sage-grouse populations that number in the hundreds, this population is considered relatively small.

Figure 11. Sage-grouse males displaying on the Sink Valley lek on March 30, 2006 at approximately 7:00am.

Northeast of the lek is a site used for roosting during the breeding period (371877 Easting 4139610 Northing UTM Nad 27; Figure 12a). This site was identified by a large number of localized fecal piles clustered within a common area (Figure 12b).

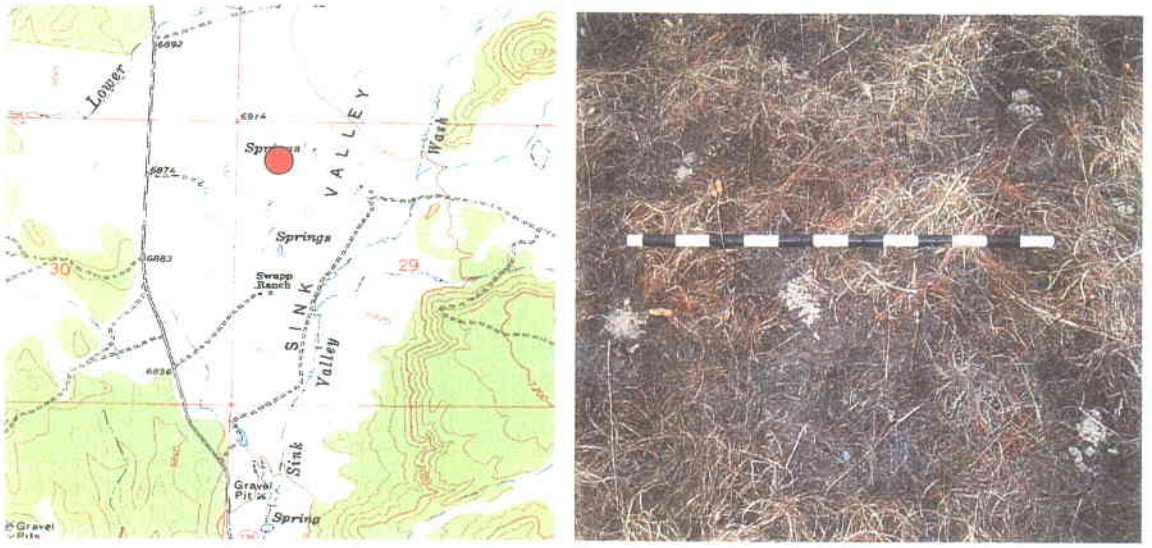


Figure 12. a) Roost site approximately 0.25 miles northeast of the Sink Valley lek (left). b) The area had dozens of tight fecal piles (right) deposited during this season's breeding period.

Nesting Habitat

Nesting is limited to infrequent stands of black and mountain big sagebrush stands. Within most of these stands, early to mid-level phases of juniper encroachment are noticeable (Figure 13). Without juniper control, intact sagebrush communities and therefore sage-grouse habitat will likely be lost from this area within the next few decades.

Summer and Winter Habitat

Within the Alton region, much of the potential sage-grouse nesting and winter habitat has been lost due to extensive juniper encroachment. As a result, during the fall of 2005 the BLM conducted a juniper removal project. This project created a narrow strip of land where all trees were cut and shreaded. Over time, this strip will become reestablish with sagebrush plants and other herbaceous plant species. Because of the short distance from juniper, it is possible that much of this area will not be used by birds for nesting or early brood-rearing. On the western end of the valley, juniper have been thinned to reduce impacts to watershed hydrology and plant structure. Since a significant number of juniper

trees were left uncut (selective harvest technique), this area remains inadequate habitat for sage-grouse nesting and brood-rearing.

Figure 13. Juniper encroachment in a black sagebrush community in the Sink Valley area. This is typical of most of the remaining sagebrush stands in the area.

Long-term Sage-grouse Status

Because of 1) the invasion of Utah juniper and pinyon pine into the few remaining stands of intact sagebrush and 2) the lack of a contiguous sagebrush community required for nesting, brood-rearing and winter habitat, the long-term survivability of the Alton sage-grouse population is poor. Additionally, the expansion of juniper throughout the region has fragmented the Alton population from other nearby populations, limiting the ability of bird migration and therefore restricted gene flow. As a result of restricted migration potential and juniper expansion, the local sage-grouse population will likely experience population declines and even eventual local extinction.

Proposed Mitigation Plan

Habitat Assessment and Mitigation of Breeding and Roosting Sites

On March 30 and April 1, 2006, vegetation measurements were taken of plants within the lek area and nearby adjacent sites. The purpose of this study was to determine if sites exist that could potentially function as alternative lek and roosting habitat during the period that the original lek and surrounding area would be disturbed by mining activities. Sites sharing similar vegetation, topographic attributes, disturbance patterns (i.e. grazing) and close proximity to sites planned for mining were identified (Figure 14). These sites were also similar in slope, aspect, and distance to juniper trees (Table 2). Two random transects were established within the lek area, the original roosting area, and the sample sites. Plant cover was sampled by species using a point-intercept method.

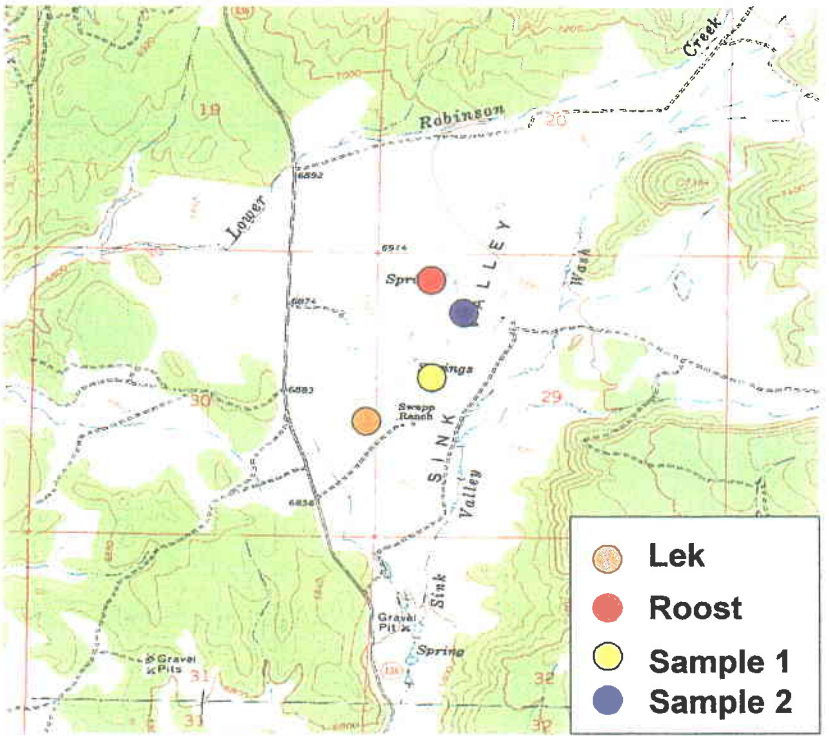


Figure 14. Location of the lek, roost, and potential alternate sites for lek and roosting habitat.

Table 2. Difference in slope, aspect, and distance to juniper at the lek, roost site, and potential alternate sites (sample sites).

	Lek	Roost	Sample 1	Sample 2
Slope (%)	3.5	4.5	4.5	4.0
Aspect (°)	204	199	201	182
Distance to Juniper (m)	>100	>150	>75	>200

Results from this work indicate that the lek and sample site 1 are similar in plant cover, bare ground, litter composition, and canopy height (figure 15). Similarly, the roosting area and sample site 2 have similar plant cover, bare ground and litter composition. Average plant height was greater in the roosting area (62%) than sample site 2 (43%). These data indicate that sites outside the mining area have similar traits to the actual lek and roost sites, and could potentially serve as alternate sites for breeding and roosting.

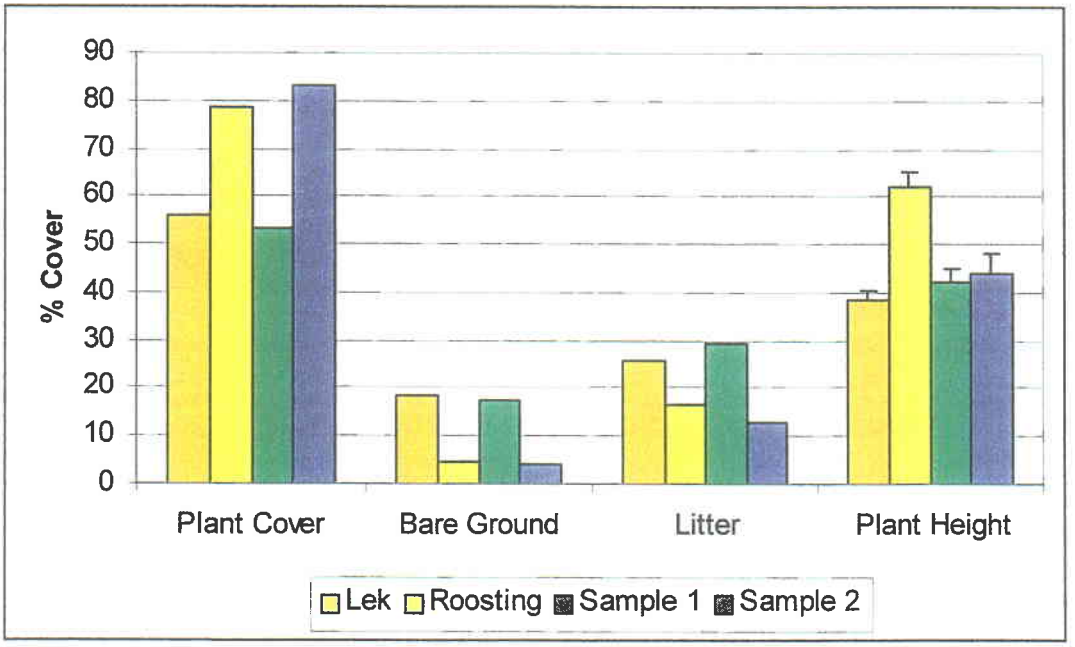


Figure 15. Percent cover of plants (combined), bare ground and litter. Plant height was measured in centimeters (right).

Creation of a Conservation Area

The current roosting area is not within the proposed mining site. This area and the alternate sample sites will be protected from any mining activity. In this "Conservation Area", habitat will be protected and enhanced for sage-grouse, especially during the breeding season. In addition to the Conservation Area, much of these grasslands and upper sagebrush stands are located along an upper terrace that provides a partial visual barrier from mining activities that will occur in the valley bottom. To create a more distinct visual barrier, spoils from mining will be stockpiled at the ridgeline (up to 20' higher) further decreasing motion and sound within the Conservation Area created during mining activities.

Short-Term Mitigation Plan

In addition to ensuring the protection of nearby grasslands and shrublands for alternate breeding and nesting areas, mining activities will be minimized so that the lowest disturbance will be created during the breeding season at areas adjacent to the original lek. After mining has been completed, reclamation specialists will return the original grade and valley form to pre-disturbance conditions. Reclamation will include seeding similar plant species with comparable plant composition, structure and function as those of the original plant community. In sites used by sage-grouse for breeding and roosting that had previous livestock grazing, livestock will be used post-reclamation to maintain similar vegetation characteristics as pre-mining conditions.

Intact sagebrush stands will be avoided for storing mining generated spoil and topsoil stockpiles. Sites will be selected for storing these materials that are distant from prime sage-grouse habitat, in particular potential nesting habitat. Coal processing equipment will be located in areas that create the least possible disturbance to sage-grouse and sage-grouse habitat. Intact sagebrush sites will be cleared of all young juniper trees with the use of chainsaws or hand tools. Trees will be removed from these stands. Juniper woodlands surrounding intact

stands can be cut back to increase patch size and increase the amount of area that has potential for nest site selection by hens.

Long-term Mitigation Plan

A significant contribution that mining can provide for enhanced sage-grouse habitat is the removal of juniper from the Alton valley. The removal of trees during mining operations with subsequent reclamation activities will create conditions that promote grass, forb and eventually sagebrush establishment. Two years after juniper was removed from plots located in eastern Oregon, Bates et al. (2000) recorded a 200-300% in percent cover and production of herbaceous vegetation. Increased plant community vigor results from decreased competition with juniper for subsurface resources (water, nutrients) and space. As a result, transpiration rates and soil surface evaporation rates will decrease and higher soil moisture will be availability for plant growth and survival. Based on anecdotal evidence, it is also possible that spring discharge will increase and seeps and spring may emerge that were lost with initial encroachment. This would provide more sites where birds would be able to obtain water during the summer and fall months.

Removing trees from extensive areas creates greater connectivity of suitable habitat. In 2005, the BLM cleared portions of the land to increase sagebrush habitat. This improvement was beneficial for improving relatively small site conditions, however, the amount of land treated was minimal compared to the level needed to sustain the sage-grouse population in the Alton area. Long-term mining plans will remove hundreds of acres of juniper woodlands, significantly increasing conditions that are more suitable to sage-grouse nesting and post-nesting requirements. This landscape-level operation could greatly enhance sagebrush restoration objectives by the BLM that is currently limited by constrained budgets and manpower.

Over time, juniper encroachment has likely been the primary factor in isolating the Alton sage-grouse population from nearby populations. According to local sources, a sage-grouse population is located approximately 6 miles north of Alton. It is likely that migration once occurred between these populations allowing an exchange of individuals and genes between the two populations. Fragmentation of the landscape by juniper has likely resulted in minimal or no movement of birds between the two populations. Similarly, two populations that once occurred further south (near Kanab) have become locally extinct, likely due to the lack of connectivity with more northern populations. According to Fuhlendorf (2001), small populations of prairie chickens became disconnected from other larger populations with increased croplands and juniper invasion. These small populations became locally extinct due to the lack of migration and gene flow potential. Therefore, by reducing the degree of fragmentation caused by expanding juniper, the potential for migration and population sustainability is increased.

Primary brood-rearing habitat in the Alton valley is associated with alfalfa fields near the town of Alton. Birds likely utilize these areas due to the availability of forbs, insects, and water. To reduce the dependency of the birds on these areas, irrigated alfalfa fields will be created in Swapp Valley (south of the Swapp Ranch house). In addition to alfalfa, many sage-grouse forage species (forbs) will be included in the seed mix. This will increase brood-rearing habitat closer to breeding and nesting habitat. This in turn will reduce potential predation that occurs near towns by ravens, crows, cats, dogs and people. It will also reduce bird mortality associated with large-scale farming practices.

The Alton sage-grouse population will be enhanced by importing birds from nearby populations that are relatively large and stable. Captured and relocated birds (initially 10-15) in the Alton area will increase genetic diversity as well as stabilize population numbers to offset losses associated with disease and emigration (unrelated to mining activities). Additionally, birds from the Alton

population (5-10) can be trapped and released in a nearby population through the mining period. Once complete, these birds can be trapped again and returned to the original Alton population. This will ensure the survival of members of the original Alton population.

Habitat Reclamation Plan

Seed mixes that are used for reclamation will consist of native grasses and forb species that provide cover and food (clover, lomatium, etc.). In order to accelerate shrub re-establishment, bareroot or potted sagebrush and bitterbrush transplants will be planted. To ensure the integrity of the planting materials, indigenous seed and cuttings will be collected for reclamation. At Bryce Canyon National Park, seed and transplants obtained from indigenous materials had greater long-term survival and higher cover and production than commercial varieties of the same species (Petersen et al. 2004).

Cursory surveys conducted on April 30th found that there is a low probability that a dominant invasive species (ie. Cheatgrass, medusahead) could establish on reclaimed sites. However, post-reclamation surveys will be conducted for undesirable invasive plants. If a breakout does occur, mechanical followed by chemical treatments will be applied.

Seeding and planting will occur in the fall season following the growing season and into dormancy. During the following growing season, vegetation sampling will be conducted to monitor reclamation success. Measurements will be continued each year until the reclamation goals have been achieved. Additional seeding can be applied during subsequent years if the minimum standards of acceptance have not been achieved. Juniper seedlings found in reclaimed areas will be removed.

Monitoring plan

Birds trapped and relocated to the Alton population will be collared with radio-colllars. Birds will be monitored throughout the year to assess bird survival, nest site and nest success, brood-rearing sites, and key winter habitat areas. Lek counts will be conducted each year to determine the number of birds at the lek. Reclamation sites will be monitored to assess restoration success. With the establishment of desirable plant communities, sagebrush obligate species habitat will be improved. Birds that depend on these communities include sage sparrows (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewer's sparrow (*Spizells breweri*). Also, mule deer habitat will increase, especially with the establishment of antelope bitterbrush and other palatable browse species. Grassland development will also increase forage for elk (*Cervus elephas*). Reclaimed sites will be monitored to assess utilization by these and other wildlife species.

To provide consistent monitoring and assessment, plans are being discussed to employ a graduate student from an established university to use this project as the basis for a graduate thesis. This would provide peer-reviewed research and monitoring of this project. It would also provide a mechanism for publishing the results of this project as a source of information and knowledge that can be applied to similar work in other areas.

Conclusion

The sage-grouse population in the Alton area is currently vulnerable to elimination regardless of mining activities. This is primarily to the loss of habitat required for nesting and brood-rearing. Therefore, a "no action" alternative will lead to population decline and potentially local extinction. To sustain sage-grouse levels in the valley, significant habitat modifications are required. Mining activities provide an opportunity to enhance sage-grouse habitat by adhering to a well-developed and established mitigation program. Information and knowledge

gained through this work can enhance our understanding of sage-grouse population dynamics and habitat requirements.

Literature Cited

Aldridge, C.L. and R.M. Bringham. 2002. Sage-grouse nesting and brood habitat use in southern Canada. Journal of Wildlife Management 66:433-444.

Autenrieth, R. E. 1981. Sage-grouse management in Idaho. Idaho Department of Fish & Game, Wildlife Bulletin 9. Boise, ID.

Barnett, J.K. and J.A. Crawford. 1994. Pre-laying nutrition of sage grouse hens in Oregon. Journal of Range Management 47:114-118.

Bates, J., R.F. Miller, and T.S. Svejcar. 2000. Understory dynamics in cut and uncut western juniper woodlands. Journal of Range Management 53:119–126.

Burkhardt, J.W., and E.W. Tisdale. 1969. Nature and successional status of western juniper vegetation in Idaho. Journal of Range Management 22:264–270.

Church, L. 2006. Personal communication. Bureau of Land Management District Office, Kanab, Utah. March 28, 2006.

Connelly, J.W., S.T. Knick, M.A. Schroeder, S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Wildlife Agencies.

Crawford, J.A., RA. Olsen, N.E. West, J.F. Mosley, M.A. Schroeder, T.D. Whitson, R.F. Miller, M.A. Gregg, and C.S. Boyd. 2004. Synthesis Paper: Ecology and management of sage grouse and sage grouse habitat. Journal of Range Management 57:2-19.

DeLong, A. K., J. A. Crawford, and D. C. DeLong, Jr. 1995. Relationships between vegetational structure and predation of artificial Sage-grouse nests. Journal of Wildlife Management 59:88-92.

Eddleman, L.E. 1983. Some ecological attributes of Western juniper. In Research in Rangeland Management, USDA, Agricultural Research Service, Special Report 682; 32-34 p.

Eng, R.L., E.J. Pitcher, S.J. Scott, and R.J. Greene. 1979. Minimizing the effects of surface coal mining on a sage grouse population by a directed shift of

breeding activities, p. 464-468. In: G.A. Swanson (tech-co-ord), The mitigation symposium. U.S.D.A. Forest Service General Technical Report. RM-65.

France, K. 2005. Masters Thesis: Interspace/under-canopy foraging patterns of beef cattle in sagebrush communities: Implications to sage-grouse nesting habitat. Oregon State University, Corvallis, Oregon.

Fuhlendorf, S.D., A.J.W. Woodward, D.M. Leslie Jr., and J.S. Shackford. 2002. Multi-scale effects of habitat loss and fragmentation of lesser prairie-chicken populations of the US Southern Great Plains. Landscape Ecology 17:617-628.

Gregg, M.A. J.A. Crawford, M.S. Drut, and A.K. DeLong. 1994. Vegetational cover and predations of sage grouse nests in Oregon. Journal of Wildlife Management 58:162-166.

Gregg, M.A. 2006. Personal conversation. Sage-grouse biologist. April 4, 2006.

Heyerdahl, E.K., R.F. Miller, and R.A. Parsons. In Press. Forest Ecology and Management.

Miller, R.F., and P.E. Wigand. 1994. Holocene changes in semiarid piñon-juniper woodlands: response to climate, fire and human activities in the U.S. Great Basin. BioScience 44:465–474.

Miller, R.F., and J.A. Rose. 1995. Historic expansion of *Juniperus occidentalis* (western juniper) in southeastern Oregon. Great Basin Naturalist 55:37–45.

Miller, R.F., T.J. Svejcar, and J.A. Rose. 2000. Impacts of western juniper on plant community composition and structure. Journal of Range Management 53:574–585.

Miller, R.F. and L.E. Eddleman. 2001. Spatial and temporal changes of sage grouse habitat in the sagebrush biome. Oregon State University Technical Bulletin 151.

Pedersen, E.K., J.W. Connelly, J.R. Hendrickson, and W.E. Grant. 2003. Effect of sheep grazing and fire on sage grouse populations in southeastern Idaho. Ecological Modeling 165:23-47.

Petersen, S.L., B.A. Roundy, and R. Bryant. 2004. Revegetation Methods for High-Elevation Roadsides at Bryce Canyon National Park, Utah. Restoration Ecology 12:248-257.

Roundy, B.A. and J.L. Vernon. 1999. Watershed values and conditions associated with pinon-juniper communities. In Proceedings: Ecology and Management of Pinon-Juniper Communities Within the Interior West. USDA Forest Service. Proceedings RMRS-P-9. Pp. 173-187.

Tate, J. Jr., M.S. Boyce, and T.R. Smith. 1979. Response of sage grouse to artificially created display ground, p. 459-463. In: G.A. Swanson (tech-co-ord), The mitigation symposium. U.S.D.A., Forest Service General Technical Report. RM-65.

Thurow, T.L. and C.A. Taylor. 1995. Juniper effects on the water yield of central Texas rangeland. In Water for Texas: Research Leads the Way. Proceedings of the 24th Water for Texas Conference, Texas Water Resources Institute, Texas A&M University, College Station. Pp. 657-665.

USGS. 2003. Sage-grouse data provided by the U.S. Geological Society. Corvallis, Oregon

Wallestad, R. O., and D. B. Pyrah. 1974. Movement and nesting of sage-grouse hens in central Montana. Journal of Wildlife Management 38:630-633.

West, N.E., R.J. Tausch, K.H. Rea, and P.T. Tueller. 1978. Taxonomic determination, distribution, and ecological indicator values of sagebrush within the pinyon-juniper woodlands of the Great Basin. Journal of Range Management 31:87-92

APPENDIX 3-2

VEGETATION OF THE SAGEBRUSH/GRASS & MEADOW AREAS

2006

FOR THE
COAL HOLLOW PROJECT

Prepared by

MT. NEBO SCIENTIFIC, INC.
Research & Consulting
330 East 400 South, Suite 6
Springville, Utah 84663
(801) 489-6937

by

Patrick D. Collins, Ph.D.

for

ALTON COAL DEVELOPMENT
Coal Hollow Project
P.O. Box 1230
Huntington, Utah 84528

April 2007

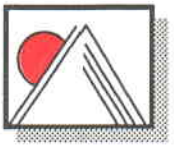


TABLE OF CONTENTS

INTRODUCTION

Alton Coal Development has proposed to surface mine coal on private land near the town of Alton, Utah. The proposed development is called the *Coal Hollow Project*. In doing so, disturbance to the plant communities that currently exist in the area will be disturbed during the mining activities. These plant communities have consecutive quantitatively sampled to provide baseline data prior to disturbance. Additionally, similar communities that will *not* be disturbed by mining have also been sampled and compared statistically to those proposed for disturbance. These areas are called "Reference Areas", and will be used for comparisons at the time of final reclamation for revegetation success standards once the property has been restored to its approximate original condition.

The Mining & Reclamation Plan (MRP) has provided information including quantitative data about the plant communities from work that was done in the same area in the late 1980's. Although this information is valuable because in provides data sets for that time, plans to re-sample the same plant communities have been made prior to any of the proposed new mining activities. Because the mining operations will be done over a period of several years, the sampling regime has been designed to focus on those plant communities that will be disturbed in consecutive order of the mining activities. Consequently, additional sampling will be conducted as the mining continues.

This document is the first in a series of reports for sampling the plant communities of the Coal

Hollow Project. Data for this report were recorded in 2006 in areas where mining activities were first planned. Since that time, the mining plan has progressed in the planning stages to a point where more is known about the sequential order in which mining will be conducted. With this refinement to the mine plan, more is known about the specific plant communities that will be disturbed over-time. Consequently, more quantitative sampling is planned in the near future, including the growing season of 2007. These data sets will also be added to the MRP and submitted to the State of Utah, Division of Oil, Gas & Mining (DOGM).

METHODS

Methodologies used for this study were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM). Quantitative and qualitative data were taken on the vegetation of the areas proposed for disturbance and their respective reference areas in August 2006.

Vegetation Maps

The first vegetation map prepared for the current MRP shows the plant communities that existed within the Coal Hollow permit area (see *Vegetation Map*, Drawing 3-1, dated 5/09/06). This map was prepared using the aforementioned existing information [the source was a 1987 map that was called: *Vegetation Community Map*, Exhibit No. 6.4-1 (7/13/87), prepared for Utah International Inc., by Cedar Creek Associates, Inc.]. This *Vegetation Map* (Drawing 3-1)

corresponds to the existing earlier data mentioned above; it has also been submitted in the MRP (see Chapter 3). Since that time, flights have been conducted to obtain new aerial photography for greater mapping detail, including a new vegetation map of the project area (*Vegetation Map*, Drawing: 3-1b, dated 12/20/06). The new data presented in this document corresponds to the new *Vegetation Map*, Drawing: 3-1b.

Sampling Design and Transect/Quadrat Placement

Transect lines for vegetation sampling were placed randomly within the boundaries of the proposed disturbed and reference areas. The transect placement technique was employed with the goal to adequately sample a representative subset of the entire site. Once the transects were established, quadrat locations for sampling were chosen using random numbers from the transect lines with the objective to record data without preconceived bias.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition, cover by species, and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and/or other appropriate notes. Plant nomenclature follows "A Utah Flora" (Welsh et al., 2003).

Woody Species Density

Density of woody plant species for the proposed disturbed and reference areas of the Sagebrush/Grass communities were estimated using the point-quarter method. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual. The number of individuals per acre was the end results of the calculations.

Woody species density in the Meadow communities were estimated using 5 ft x 25 ft belt transects.

Sample Size & Adequacy

Sampling adequacy for cover and density was attempted by using the formula given below.

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

nMIN	= minimum adequate sample
t	= appropriate confidence t-value
s	= standard deviation
x	= sample mean
d	= desired change from mean

Statistical Analyses

Student's t-tests were employed to compare the total living cover and total woody species density of each proposed disturbed area with its respective reference area.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been submitted with this report.

Threatened & Endangered Plant Species

Prior to recording quantitative data on the plant communities, a sensitive plant species survey was conducted. To initiate the study, appropriate agencies were consulted and other sources were reviewed (sensitive species files at *Mt. Nebo Scientific, Inc.*) for potential plant species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the study area.

RESULTS

Below are the results from sampling each vegetation study site for this report. Color photographs of each sample site have also been provided later in this document.

Sagebrush/Grass (Proposed Disturbed)

One plant community proposed for disturbance by Year 1 mining activities is the Sagebrush/Grass community. This community is often found near Pinyon-Juniper communities and consequently has pinyon pine (*Pinyon edulis*) and Utah juniper (*Juniperus osteosperma*) trees scattered throughout it. As shown on Table 1, the dominate plant species by cover in the proposed disturbed Sagebrush/Grass community were big sagebrush (*Artemisia tridentata* var. *tridentata*) and black sagebrush (*A. nova*). [NOTE: Positive identification of individuals in the genus *Artemisia* of the area were sometimes inconclusive. For example, some individuals of the sagebrush appeared to have been closer to *A. tridentata* var. *wyomingensis* or a hybridization of other species in the genus *Artemisia* i.e. *A. tridentata* var. *tridentata*, and *A. nova*].

The most common grass species were junegrass (*Koeleria macrantha*), Sandberg's bluegrass *(Poa secunda*), and Kentucky bluegrass (*P. pratensis*). Forb cover was low, but the species present in the quadrats were scarlet gilia *(Ipomopsis aggregata*), redroot buckwheat (*Eriogonum racemosum* var. *racemosum*), and blue flax *(Linum perenne*).

The total living cover of the community was estimated at 54.73%, of which 52.40% of it was from understory cover and only 2.33% was from overstory (Table 2-A). The understory composition was comprised of 64.09% shrubs, 34.64% grasses, and 1.28% forbs (Table 2-B).

Woody species density of the Sagebrush/Grass community was also measured. The total number of individuals per acre was 8,339, most of which was comprised of black sagebrush and big sagebrush (Table 3).

Sagebrush/Grass (Reference Area)

The plant community that will remain undisturbed and was selected for its similarity to the proposed disturbed area above will be used for future revegetation success standards. This reference area had similar cover, composition, and woody species density. Cover and frequency by species of the Sagebrush/Grass reference area is shown on Table 4. The dominant shrub plant species here were black sagebrush and big sagebrush. The most common grass species were slender wheatgrass (*Elymus trachycaulus*), cheatgrass *(Bromus tectorum*), Kentucky bluegrass, and Sandberg's bluegrass.

The total living cover of the area was estimated at 60.50%, all of which was from understory cover (Table 5-A). Woody species dominated the composition at 61.48%, whereas grasses comprised 29.86%, and forbs 8.65% (Table 5-B).

The total number of plants per acre in the woody species density measurements was 8,331 (Table 6). Big sagebrush and black sagebrush dominated the woody species in the density measurements and were nearly equally represented.

Meadow - Dry (Proposed Disturbed)

There are different meadowlands located within the permit area. These meadows have somewhat been differentiated on the *Vegetation Map* (Drawing: 3-1b) as dry, wet or some where between the two. The Year 1 mining operations would disturb a dry Meadow community on the west side of the permit area.

As shown on Table 7, the dominant species in the proposed disturbed Meadow were grass and grass-like species including sedge (*Carex* sp.), wiregrass (*Juncus arcticus*) and junegrass. Broom snakeweed (*Gutierrezia sarothrae*) was the dominant shrub, whereas the dominant forbs were yarrow (*Achillea millefolium*) and Pacific aster (*Aster ascendens*).

The total living cover was estimated at 73.00% (Table 8-A). The composition of the understory was 75.70% grasses (and grass-likes), 13.28% forbs, and 11.01% shrubs (Table 8-B). The woody species density was represented by only one plant, black sagebrush – it totaled only 817 plants per acre (Table 9).

Meadow - Dry (Reference Area)

The dominant grass and grass-like species in the dry Meadow reference area were wiregrass, sedge, and junegrass (Table 10). The dominant forbs were yarrow, Pacific aster, and cinquefoil (*Potentilla anserina*). The only shrubs present in the sample quadrats were black sagebrush and broom snakeweed.

The total living cover of this reference area was 72.00% (Table 11-A). The understory cover composition was comprised of 71.05% grasses (and grass-likes), 22.31% forbs, and 6.64% shrubs (Table 11-B). The total woody species density of the community was 1,481 plants per acre and was comprised exclusively of black sagebrush (Table 12).

Threatened & Endangered Plant Species Survey

No rare, endemic, threatened, endangered or otherwise sensitive species were found in the study areas.

Table 1: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Sagebrush/Grass (Proposed Disturbed)	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY COVER			
Juniperus osteosperma	2.33	9.55	6.67
UNDERSTORY COVER			
TREES & SHRUBS			
Artemisia nova	14.93	17.10	50.00
Artemisia tridentata var. tridentata	15.23	20.48	26.67
Chrysothamnus depressus	2.07	5.90	16.67
Gutierrezia sarothrae	1.23	2.79	20.00
FORBS			
Eriogonum racemosa	0.33	1.25	6.67
Ipomopsis aggregata	0.33	1.25	6.67
Linum perenne	0.10	0.54	3.33
GRASSES			
Bouteloua gracilis	2.33	8.54	10.00
Bromus tectorum	0.83	3.18	6.67
Elymus smithii	0.50	1.98	6.67
Elymus trachycaulus	0.50	1.98	6.67
Hordeum jubatum	0.83	1.86	16.67
Koeleria macrantha	4.17	10.25	23.33
Poa pratensis	3.17	7.69	16.67
Poa secunda	4.00	7.00	30.00
Stipa hymenoides	1.83	3.53	23.33

Table 2: Coal Hollow Project. Total Cover and Composition (2006).

Sagebrush/Grass (Proposed Disturbed)		
A. TOTAL COVER	Mean Percent	Standard Deviation
Overstory Cover (o)	2.33	9.55
Understory Cover (u)	52.40	13.67
Litter	16.17	10.90
Bareground	26.87	11.83
Rock	4.57	6.15
TOTAL LIVING (o + u)	54.73	13.52
B. % COMPOSITION (u)		
Shrubs	64.09	22.93
Forbs	1.28	3.55
Grasses	34.64	22.43

Table 3: Coal Hollow Project. Woody Species Density (2006).
Sagebrush/Grass (Proposed Disturbed)

SPECIES	Individuals Per Acre
Artemisia tridentata	2779.73
Artemisia nova	4100.11
Chrysothamnus depressus	833.92
Chrysothamnus nauseosus	69.49
Chrysothamnus viscidiflorus	138.99
Gutierrezia sarothrae	277.96
Juniperus osteosperma	138.99
TOTAL	**8339.20**

Table 4: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).
Sagebrush/Grass (Reference Area)

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia nova	23.85	18.18	75.00
Artemisia tridentata	10.90	13.39	55.00
Chrysothamnus nauseosus	2.10	3.78	25.00
Gutierrezia sarothrae	0.90	2.72	10.00
Juniperus osteosperma	0.25	1.09	5.00
FORBS			
Achillea millefolium	0.25	1.09	5.00
Aster ascendens	3.00	4.58	35.00
Erigeron religiosus	0.25	1.09	5.00
Iva axillaris	1.00	2.00	20.00
Sphraelcea coccinea	0.25	1.09	5.00
GRASSES			
Bromus tectorum	4.75	6.61	45.00
Elymus smithii	0.50	2.18	5.00
Elymus trachycaulus	5.25	9.93	30.00
Juncus arcticus	0.75	3.27	5.00
Poa pratensis	3.00	7.65	15.00
Poa secunda	2.75	5.36	25.00
Stipa hymenoides	0.75	2.38	10.00

Table 5: Coal Hollow Project. Total Cover and Composition (2006)		
Sagebrush/Grass (Reference Area)		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover	60.50	13.03
Litter	13.05	4.81
Bareground	25.05	13.58
Rock	1.40	1.20
TOTAL LIVING (o + u)	60.50	13.03
B. % COMPOSITION (u)		
Trees/Shrubs	61.48	17.01
Forbs	8.65	8.73
Grasses	29.86	14.18

Table 6: Coal Hollow Project. Woody Species Density (2006).

Sagebrush/Grass Community (Reference Area)	
SPECIES	**Individuals Per Acre**
Artemisia tridentata	3644.87
Artemisia nova	3957.29
Chrysothamnus nauseosus	624.83
Gutierrezia sarothrae	208.28
TOTAL	**8331.13**

Table 7: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Meadow - Dry (Proposed Disturbed)	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia nova	1.00	2.00	20.00
Gutierrezia sarothrae	7.20	4.80	85.00
FORBS			
Achillea millefolium	6.40	6.42	55.00
Aster ascendens	2.00	4.00	25.00
Eriogonum racemosa	0.25	1.09	5.00
Linum lewisii	1.00	3.39	10.00
Potentilla anserina	0.25	1.09	5.00
GRASSES			
Bouteloua gracilis	2.25	6.80	10.00
Carex sp.	27.50	19.46	75.00
Elymus elymoides	0.50	1.50	10.00
Elymus smithii	0.75	2.38	10.00
Hordeum jubatum	0.50	2.18	5.00
Juncus arcticus	10.25	13.27	70.00
Koeleria macrantha	8.00	10.17	55.00
Muhlenbergia asperifolia	0.50	2.18	5.00
Poa pratensis	4.65	10.62	25.00

Table 8: Coal Hollow Project. Total Cover and Composition (2006)

Meadow - Dry (Proposed Disturbed)		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover	73.00	9.67
Litter	9.40	3.28
Bareground	16.50	9.67
Rock	1.10	0.30
B. % COMPOSITION (u)		
Shrubs	11.01	8.10
Forbs	13.28	8.74
Grasses	75.70	13.81

Table 9: Coal Hollow Project. Woody Species Density (2006).
Meadow - Dry (Proposed Disturbed)

SPECIES	Individuals Per Acre
Artemisia nova	816.75
TOTAL	**816.75**

Table 10: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).
Meadow - Dry (Reference Area)

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia nova	3.25	6.76	25.00
Gutierrezia sarothrae	1.50	3.91	15.00
FORBS			
Achillea millefolium	5.50	5.45	60.00
Artemisia campestris	1.25	3.83	10.00
Aster ascendens	5.00	6.12	50.00
Eriogonum racemosa	0.25	1.09	5.00
Linum lewsii	0.25	1.09	5.00
Potentilla anserina	3.25	7.12	20.00
GRASSES			
Bouteloua gracilis	1.75	5.76	10.00
Carex sp.	16.50	12.05	80.00
Elymus elymoides	0.75	3.27	5.00
Elymus smithii	0.50	2.18	5.00
Elymus spicatus	1.50	6.54	5.00
Elymus trachycaulus	4.00	9.82	15.00
Juncus arcticus	15.25	16.84	70.00
Koeleria macrantha	9.50	11.06	45.00
Muhlenbergia asperifolia	0.25	1.09	5.00
Poa pratensis	1.75	4.26	15.00

Table 11: Coal Hollow Project. Total Cover and Composition (2006).		
Meadow - Dry (Reference Area)		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover	72.00	8.86
Litter	11.70	5.16
Bareground	14.70	6.65
Rock	1.60	2.18
B. % COMPOSITION (u)		
Shrubs	6.64	10.29
Forbs	22.31	12.24
Grasses	71.05	12.91

Table 12: Coal Hollow Project. Woody Species Density (2006).

Meadow - Dry (Reference Area)	
SPECIES	**Individuals Per Acre**
Artemisia nova	1481.04
TOTAL	**1481.04**

SUMMARY & DISCUSSION

When the total living cover of the proposed disturbed Sagebrush/Grass community was compared statistically with the reference area using the Student's t-test, the difference was non-significant (Fig. 1). Moreover, when the woody species densities of these two stands were compared and these differences were also non-significant (Fig. 2).

FIG. 1. STUDENT'S T-TEST - **Total Living Cover** Comparison Between the Proposed Disturbed Sagebrush/Grass Community and the Reference Area (2006).

Proposed Disturbed: $\bar{x}$=54.73; s=13.52; n=30

Reference Area: $\bar{x}$=60.50; s=13.03; n=20

t =1.500 ; df =48 , SL= N.S.

FIG. 2. STUDENT'S T-TEST - **Woody Species Density** Comparison Between the Proposed Disturbed Sagebrush/Grass Community and the Reference Area (2006).

Proposed Disturbed:: $\bar{x}$=8339.20; s=3604.59; n=30

Reference Area: $\bar{x}$=8331.13; s=2489.88; n=20

t = 0.009; df =48 , SL= N.S.

Similarly, when the total living cover of the proposed disturbed Meadow community was compared with its reference area, the differences were also non-significant (Fig. 3). Finally, the differences in the woody species density of the proposed disturbed Meadow and the reference area were compared; the t-tests suggested that the differences were negligible (Fig. 4).

Quantitative sampling and subsequent statistical analyses comparing the total living covers and woody species densities of the plant communities proposed for disturbed with their respective reference areas suggest that the differences were negligible. These analyses, along with the plant species present in the sample quadrats and the lifeform composition, also suggest that the reference areas chosen to represent future revegetation success standards at the time of final reclamation may be appropriate to be used as such.

FIG. 3. STUDENT'S T-TEST - **Total Living Cover** Comparison Between the Proposed Disturbed Meadow (dry) Community and the Reference Area (2006).

Proposed Disturbed: $\bar{x}$=73.00; s=9.67; n=20

Reference Area: $\bar{x}$=72.00; s=8.86; n=20

t = 0.341; df =38 , SL= N.S.

FIG. 4. STUDENT'S T-TEST - **Woody Species Density** Comparison Between the Proposed Disturbed Meadow (dry) Community and the Reference Area (2006).

Proposed Disturbed:: $\bar{x}$=816.75; s=2140.40; n=20

Reference Area: $\bar{x}$=1481.04; s=1999.97; n=20

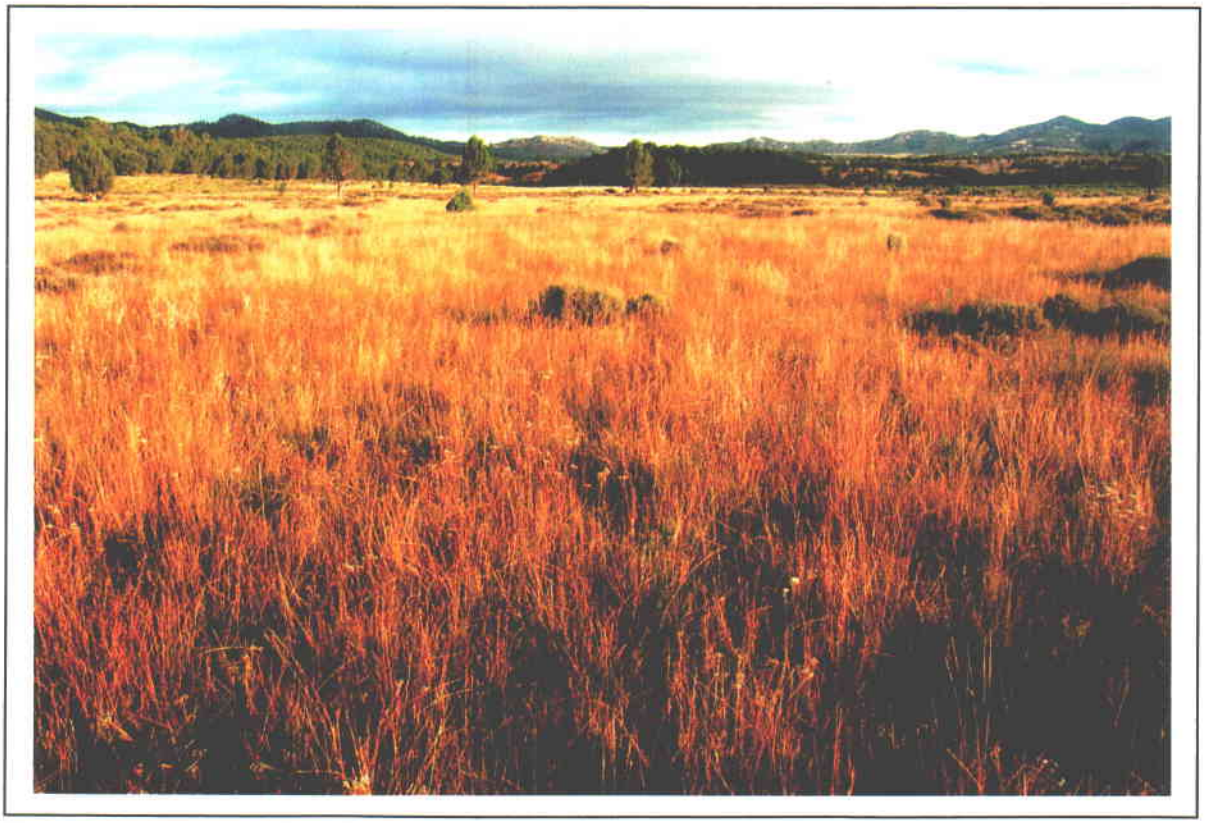
t =-1.014 ; df =38 , SL= N.S.

COLOR PHOTOGRAPHS
OF
SAMPLE AREAS

Photograph 1: Proposed Disturbed Sagebrush/Grass Community

Photograph 2: Sagebrush/Grass Community Reference Area

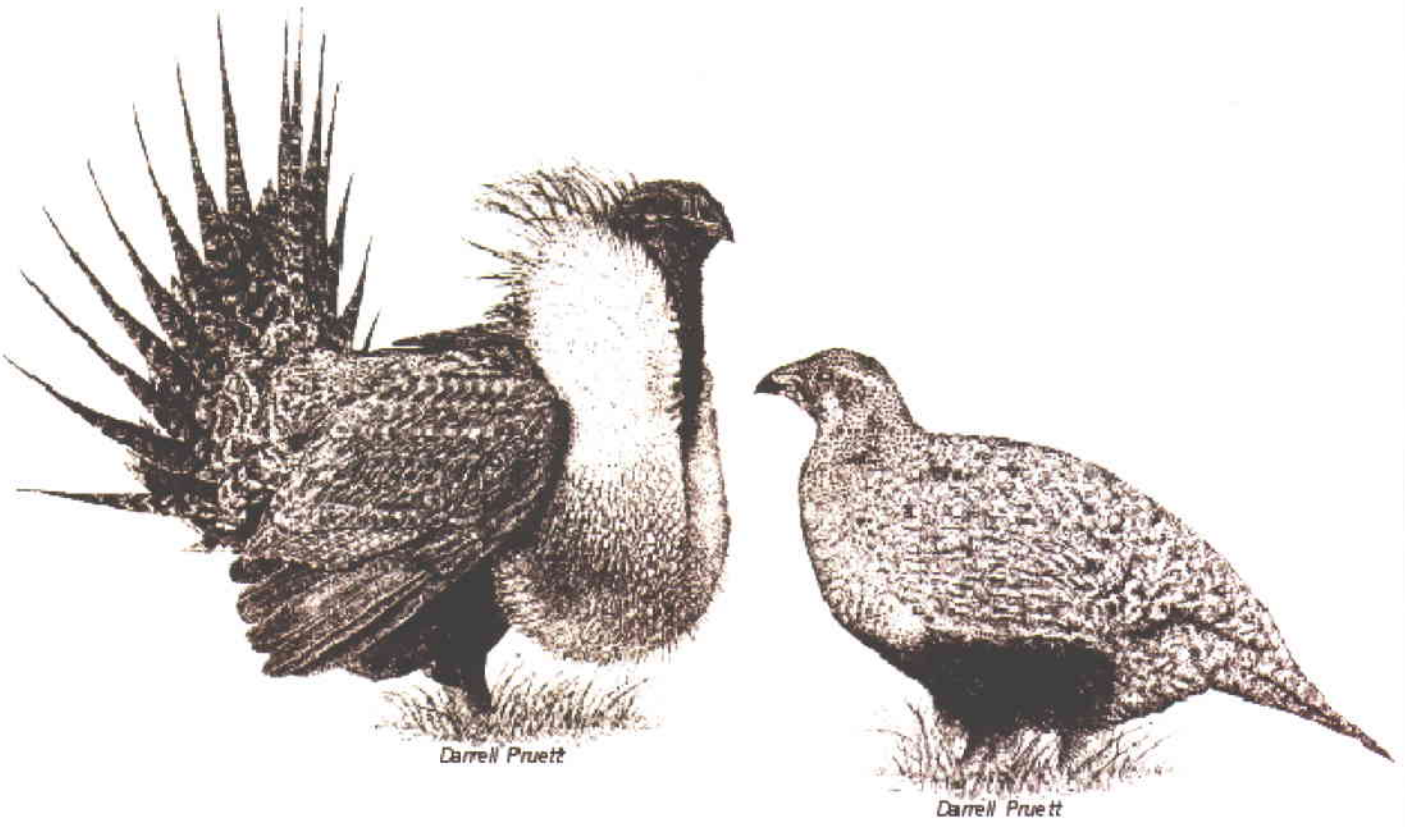
Photograph 3: Proposed Disturbed Meadow (Dry) Community



Photograph : Meadow (Dry) Reference Area

APPENDIX 3-3

SAGE-GROUSE DISTRIBUTION AND HABITAT IMPROVEMENT ALTON, UTAH



Steven L. Petersen, Ph.D.

May 2007

SAGE-GROUSE DISTRIBUTION AND HABITAT IMPROVEMENT ALTON, UTAH

Steven L. Petersen, Ph.D.

May 2007

INTRODUCTION

In 2006, the report titled "Alton Sage-grouse Habitat Assessment and Mitigation Plan" characterized the population status and habitat conditions of the greater sage-grouse (*Centrocercus urophasianus*) in the Alton, Utah region. In this document, a mitigation plan was proposed to improve sage-grouse habitat in an effort to increase bird population levels within the region and maintain optimal sage-grouse habitat for nesting, brood-rearing, summer and winter use. The purpose of this report is to provide an update of the progress made in the area since the plan was established, and to provide additional information on sage-grouse population characteristics not presented in the previous report. Specifically, this paper will discuss the following issues related to population trends and habitat improvement:

1. sage-grouse population and distribution monitoring
2. results of the 2007 sage-grouse trapping and blood sampling efforts
3. description of an attempt to lure birds from the lek to an alternative lek site
4. mitigation implementation and strategies
5. lek search and aerial habitat assessment
6. proposed habitat and predator control mitigation

SAGE-GROUSE POPULATION AND DISTRIBUTION MOINTORING

Bird observations within the Alton region have been highly variable. During the first spring trapping session, 16 birds were flushed. In the winter and early spring, larger flocks were purportedly flushed with upward of 20-30 birds per flock. However, an accurate estimate is difficult since relatively few birds were observed at the lek during the mating season (March and April). In comparison to 14 adult male sage-grouse strutting on the Sink Valley lek in 2006, only 5 birds were observed on the lek in 2007.

Two leks have been positively identified in the Alton and Hatch area, and an unconfirmed third lek has been reported southeast of the Hatch lek. The Sink Valley lek (Figure 1a) is located in a valley bottom pasture (37° 23' 21.95 N, 112° 27' 06.64 W., 6866 ft. elevation. Plant species occurring in the lek area include a mix of both native and introduced grasses and forbs The Heuts Ranch lek, located approximately 13.5 miles north of Alton, is dominated by big sagebrush (37° 35' 00.79" N, 112° 27' 29.08" W, 7073 ft. elevation; Figure 1b). Unlike Sink Valley, this lek is positioned in an open landscape, lacking extensive juniper encroachment that is characteristic of the Sink Valley region. Heuts Ranch lek is position adjacent to a relatively large sink area which ponds during the spring.

The landscape between Sink Valley and Heuts Ranch has both open flats as well as juniper encroached slopes. The hills north of Alton have been particularly encroached by juniper trees. The increase in juniper over time has likely reduced bird movement between the two populations, leading to fragmentation of these two sub-populations. Fuhlendorf suggests that limit gene flow between populations may result in a decline in population resilience and even small-scale extinction events (Fuhlendorf et al. 2003).

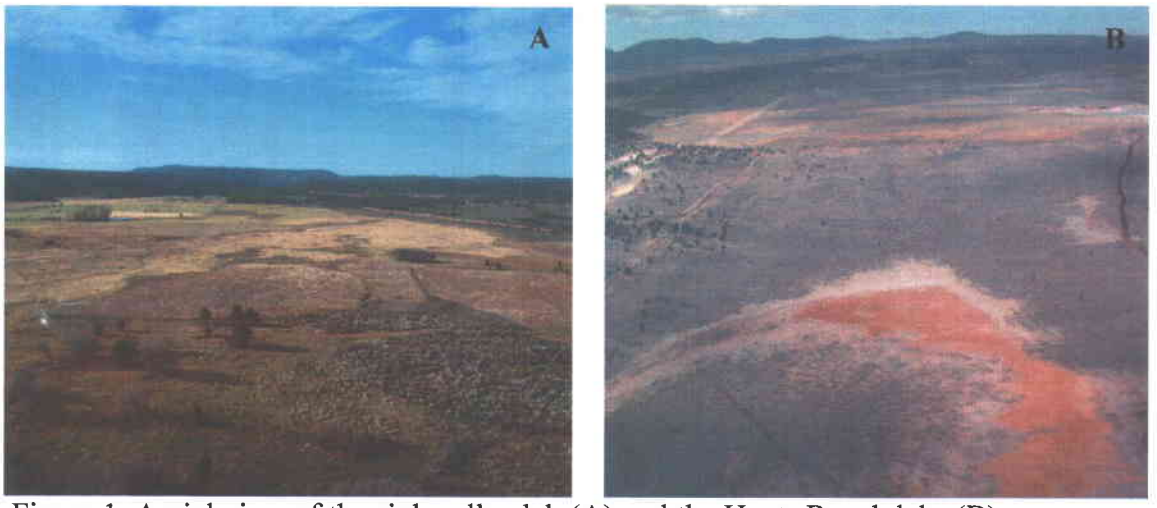


Figure 1. Aerial view of the sink valley lek (A) and the Heuts Ranch leks (B).

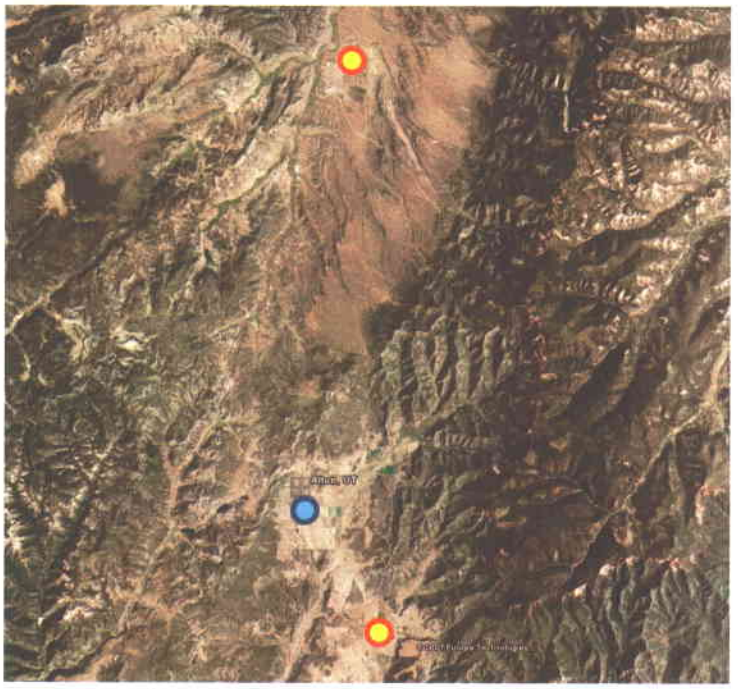


Figure 2. Topography and juniper woodlands separate Sink Valley (below) and Heuts Ranch (above) leks (Google 2007). The blue dot mark the town of Alton.

Sage-grouse in the Sink Valley area remain within the valley throughout the year. Frey and Curtis (2007) have been monitoring several birds for the last two years. They suggest that spring and summer habitat use vary only slightly from fall and winter habitat use (Figure 1).

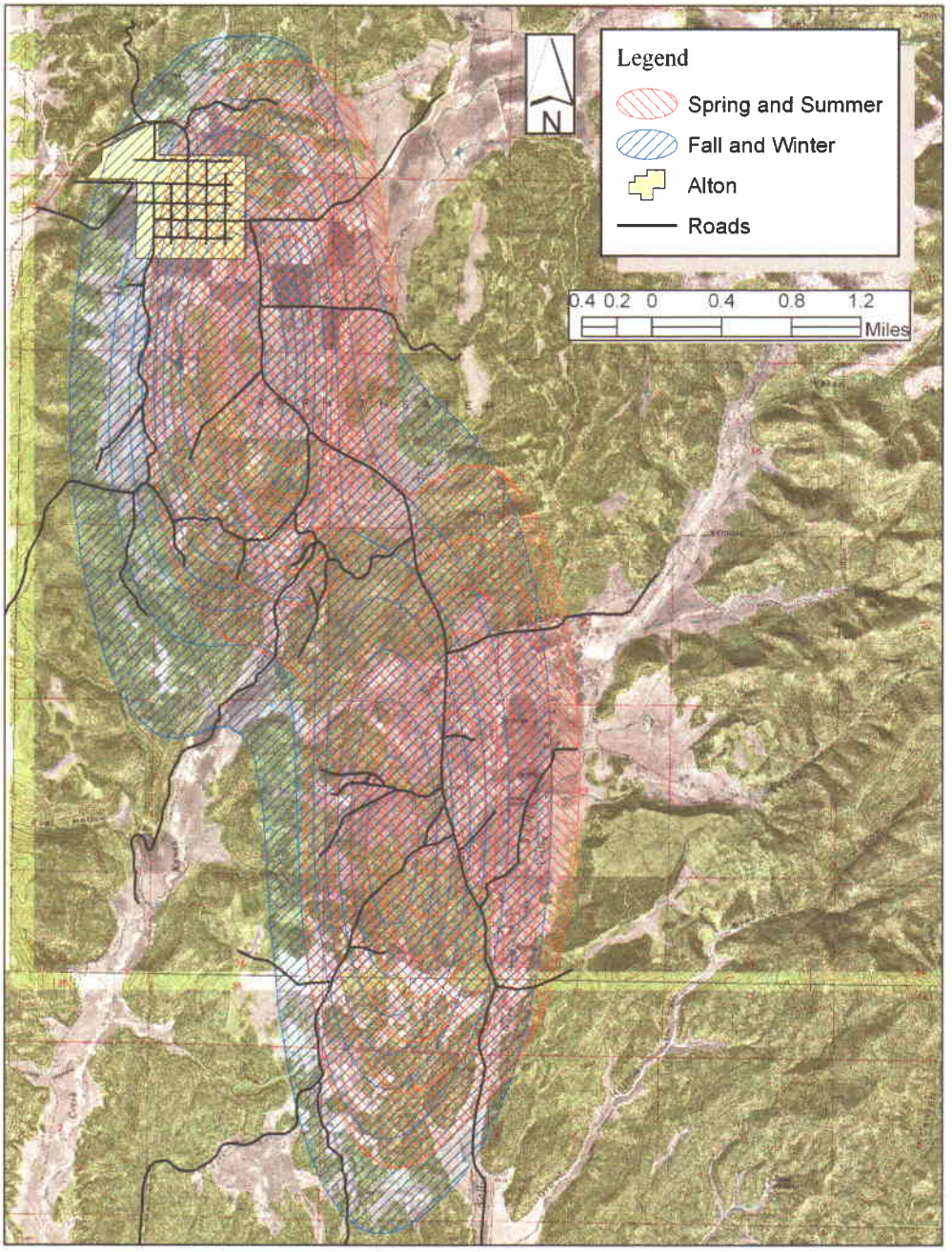


Figure 1. Distribution patterns of sage-grouse throughout the year in the Alton / Sink Valley areas. Distribution patterns were determined from collared birds that were monitored between 2005-2007.

SAGE-GROUSE TRAPPING AND BLOOD SAMPLING

Bird Trapping

Two adult males were trapped during four trapping nights within the Sink Valley area (Figure 4). Six birds were trapped at the Heuts Ranch lek on a single trapping night. Trapping was conducted during the nighttime hours, usually between 10:00 pm and 3:00 am. Four-wheelers and spotlights were used to locate birds during the first three trapping nights. A backpack generator with spotlight was used to locate birds on the last trapping night of the season.

Trapping dates and trap numbers are as follows:

March 24	2 birds trapped, 16 birds flushed. Six people formed two groups with 3 per group.
April 2	0 birds trapped, approximately 5 birds flushed (1 group, 4 trappers)
April 11	0 birds trapped, 0 birds flushed
May 3	0 birds trapped, 2 birds flushed

Figure 4. Adult male sage-grouse trapped in the Sink Valley area on March 24, 2007.

Since the number of birds trapped were low during the 2007 breeding season, additional birds will be trapped in the fall (September to October) to maintain an adequate population sample size. Since the Alton sage-grouse congregate near the alfalfa fields adjacent to the town, biologists are able to spot-light, trap and collar adult and juvenile birds during non-breading periods. Higher collared bird numbers increases the accuracy of predicting habitat use throughout the bird's life-cycle creating a more focused and effective management direction.

Since relatively little is known about habitat use by the Heuts Ranch brids, we hope to trap and monitor many birds from this population. Members of the Color Country Sage-grouse Working Group are familiar with this population and will be included as much as possible in trapping and monitoring these birds. In addition to providing a reference dataset for the Sink Valley population, these data will also assist local managers in monitoring trend and distribution patterns of the Heuts Ranch population. 30-40 collars and a backpack generator / spotlight will be purchased prior to the fall trapping season by Talon Inc. to facilitate trapping efforts and population monitoring. Talon is also willing to provide a technician as needed to monitor collared birds in both areas.

Transmitter Fitting and Blood Sampling

In the Sink Valley area, the two birds trapped were harnessed with a transmitter (collar) for monitoring throughout the next year. Chel Curtis, a wildlife technician from Southern Utah University is currently monitoring the birds and reporting this data to Nicole Frey and the Color County Sage-grouse Working Group.

Blood samples were taken from both birds trapped on march 24th. These samples will be used for genetic analyses to provide insight on genetic differentiation between Sink Valley and the Heuts Ranch populations. Additional samples will be collected from both leks during the fall and spring breeding seasons to ensure that sufficient samples have been collected in order to accurately assess genetic isolation or suppressed gene flow between the two populations. According to Craig Coleman, a geneticist at Brigham Young University, a minimum of 15-20 samples are needed from each population to reliability (statistically) characterize genetic traits of each population. Scientists at Brigham Young University have agreed to analyze the DNA samples as a collaborative research opportunity.

In time, the data generated from the genetic analysis as well as data from bird monitoring, habitat assessment and habitat improvements could potentially be further developed into a graduate research project at an established university (i.e. BYU, USU).

BIRD LURING FROM LEK

On March 24, four silhouette decoys were constructed depicting two adult female and two adult male sage-grouse. Decoys were placed at a similar site approximately 50 m away from the primary lekking region. An audio player was used to broadcast strutting calls in attempt to lure the birds to this alternate site. Strutting males did not exhibit behavior that would indicate an attempt to shift mating behavior closer to the decoys. Two females spotted near the lek also showed no obvious movement toward the decoys. Since the birds were already located on or near the original intact lek, it was not surprising that they did not shift breeding activities toward the decoys. Bird luring, however, may be a successful method when the lek has been disturbed. Under these conditions, an alternative lek may provide a suitable alternative for courtship displays and mating.

SAGE-GROUSE HABITAT: IMPROVEMENT, RESTORATION AND MITIGATION

HABITAT MITIGATION IMPLIMENTATION

Juniper removal

According to Crawford et al. (2004), the majority of sage-grouse in a population will nest within 3-5 km of the lek. Within these areas, birds generally select intact sagebrush sites with 15-25% shrub cover (Connelly et al. 2000). In most sagebrush stands in the Alton region, Utah juniper (*Juniperus osteosperma*) has encroached at varying densities and canopy cover. Encroached trees range from seedlings to mature adults. To reduce the potential impact of juniper on nesting success and ecological degradation, individual trees were removed using a Kobelco compact excavator with grappling claw (Figure 5).

Figure 5. Removal of juniper from sagebrush stands in the Sink Valley area.

During the 5 days of operation, approximately 8,000 trees were removed from a juniper encroached sagebrush and adjacent Gambel oak woodland in the northeast section of Sink valley. Extracted trees were first piled, and then loaded into a dump truck prior to being hauled to a dump site where they will be burned during the fall.

Tree removal resulted in a more continuous juniper-free sagebrush dominated plant community, which is more suitable for nesting and brood rearing (Idaho Conservation Plan 2006). By eliminating trees, raptors lack perching sites to watch for chicks and adult

birds. Juniper removal also reduces competition between juniper and sagebrush and other desirable plant species (Petersen 2006). Figure 6 shows a site before juniper removal methods were applied (above) and an adjunct site just cleared of juniper (below).

Figure 6. Comparison between sites before jniper removal (above) and post-treatment (below). Juniper was removed using a compact excavator, seen on the left side of the picture near a large extracted juniper pile.

SAGE-GROUSE LEK SEARCH AND AERIAL HABITAT ASSESSMENT

Two helicopter flights, arranged by Talon Inc., were taken on April 12 and April 20 to investigate both known leks and to search for unknown satellite leks. During these flights, approximately 20 strutting male birds were observed on the Heuts Ranch lek. During the first pass, birds remained on the lek. However, by the second pass, many birds flew to nearby cover. At Sink Valley, only a single bird was observed on the lek. After flying through the general vicinity of both known leks, no additional birds or satellite leks were detected. This included a search in other pastures, meadows, along drainages, and along open mesas. Based on the response of the lekking birds at Heuts Ranch, we assume that the birds would have been detectable had we encountered displaying males.

PROPOSED HABITAT MITIGATION

Brood-rearing habitat improvement

Based on last years bird monitoring data, many female birds bring their brood to the alfalfa fields adjacent to the town of Alton for foraging. Chicks likely consume alfalfa leaves as well as an abundance of forbs and insects. Since close proximity to Alton presents potentially hazardous conditions for young birds such as large farming equipment and high densities of predatory animals (Petersen Report 2006), a substitute alfalfa field will be established near the lek in Sink Valley. The field, located approximately 100 m southeast of the lek, will be seeded with alfalfa (*Medicago sativa*) as well as many forb species important for sage-grouse foraging. These species include western yarrow (*Achillea millifolium*), clover (Trifolium spp.), false dandelion (Agoseris glauca), microseris (*Microseris* spp.), lomatium (*Lomatium* spp.), and groundsmoke (*Gayophytum* spp.) to name a few.

Research is currently being conducted to determine plant species that host important insect species. Based on the results of these studies, additional species can be included in seed mixes that enhance insect availability. According to Gregg (2006), sage-grouse chick survival is significantly higher when prey insect species are readily available. In addition to common components of a chicks diet such as ants and beetles, Gregg found that high densities of caterpillars (moth larvae) resulted in high chick survival. Plants that provide a food base for these insects can enhance chick foraging behavior and potentially increase survival.

Predator control

Several species that prey on sage-grouse live in the Alton region (Figure 7). The density of common ravens (*Corvus corax*) and America crows (*Corvus brachyrhynchos*) are particularly high, especially near town where these birds have a consistent food supply (feed lots, garbage cans, etc.). These birds have been found to be a significant predator on chicks and eggs. Coyotes (*Canus latrans*) are common mammalian predators of sage-grouse and their eggs.

According to DeLong (1995), nest failure is closely associated with coyotes, avian predators, and small mammal species. According to Gregg (2006), areas that lacked adequate hiding cover were predisposed to high rates of raven and coyote predation.

To limit impacts to adults and chicks, predator control can be used to reduce the densities of several predator species. Arrangements will be discussed with local wildlife agencies to evaluate the potential of using predator control to increase egg and brood survival.

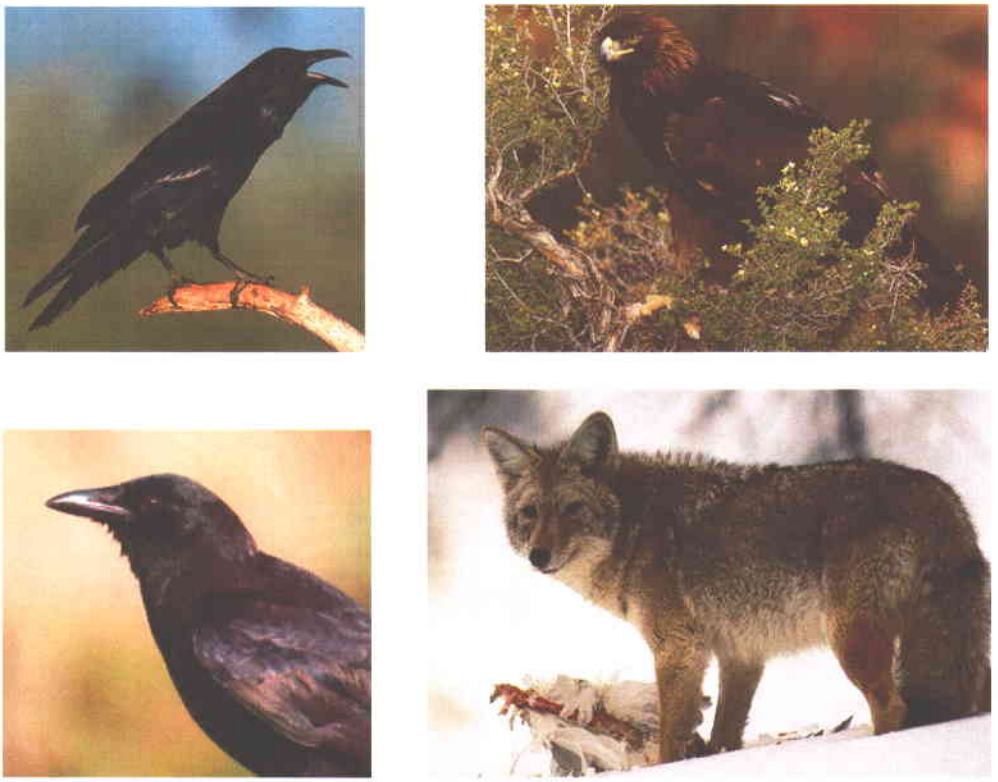


Figure 7. Sage-grouse predators common in the Alton region include common raven (upper left), golden eagle, American crow (lower left) and coyote.

Habitat connectivity

The citizens of Alton have started to remove juniper trees on private ground between the Sink Valley and Heuts Ranch leks with the expectation is juniper removal will enhance sagebrush habitat for wildlife. This effort may also create migration corridors between the two populations enhancing population sustainability and increasing gene flow.

REFERENCES

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines for management of sage-grouse populations and habitat. Wildlife Society Bulletin 28:967-985.

Crawford, J.A., R.A. Olsen, N.E. West, J.C. Mosley, M.A. Schroeder, T.D. Whitson, R.F. Miller, M.A. Gregg, and C.S. Boyd. 2004. Ecology and management of sage-grouse and sage-grouse habiat. Journal of Range Management 57:2-19.

DeLong, A.K., J.A. Crawford, and D.C. DeLong. 1995. Relationship between vegetational structure and predation of artificial sage-grouse nests. Journal of Wildlife Management 59:88-92.

Fuhlendorf, S., A.J. Woodward, D.M. Leslie, and J.S. Shackford. 2002. Multi-scale effects of habitat loss and fragmentation on lesser prairie-chicken popuations of the US Southern Great Plains. Landscape Ecology 17:617-628.

Frey, N, and C. Curtis. 2007. USU Extension and Southern Utah University. Personal communication.

Gregg, M.A. 2006. Greater sage-grouse reproductive ecology: linkages among habitat resources, maternal nutrition, and chick survival. Ph.D. Dissertation, Oregon State University, Corvallis, Oregon.

Idaho Sage-grouse Advisory Committee. 2006. Conservation Plan for the Greater Sage-grouse in Idaho.

Petersen, S.L. 2006. Alton Sage-grouse Habitat Assessment and Mitigation Plan. Talon, Inc.

ACKNOWLEDGEMENTS

We appreciate the contribution and collaboration of Nicole Frey (USU Extension – Cedar City, Utah), Chel Curtis.(Southern Utah University), and Kevin Heaton (USU Extension – Panguitch, Utah).

Cover photograph
Image by Darrel Pruett, copied from the USGS NPWRC website
http://www.npwrc.usgs.gov/resource/literatr/grasbird/grsg/bird.gif

CHAPTER 4

LAND USE AND AIR QUALITY

R645-301-400

TABLE OF CONTENTS

Chapter 4

R645-301-400

LAND USE AND AIR QUALITY

CHAPTER 4

R645-301-400. LAND USE

410. REGIONAL LAND USE

Land use and agricultural production in the Coal Hollow Project region centers around livestock production. Rangeland use for cattle grazing is the predominant land use in the Region. The majority of the land is classified as unimproved rangeland.
Some farming is done within the surrounding lands but crop choice and production levels are severely restricted by climate, soil, and water availability conditions. Alton and Sink Valley incur frequent early spring frost conditions as a result of cold air drainage into these low-lying valleys. These conditions and the resultant short growing season restrict crop choice to the more hardy wheat and small grain crops and alfalfa hay.
This land is also used as watershed, recreational hunting, and wildlife habitat.

Within the permit boundaries, all lands and mineral resources are owned privately. These lands are mainly used for grazing, and native wildlife habitat.

411. ENVIRONMENTAL DESCRIPTION

The permit area is within elevations 6840 feet and 7000 feet. It incorporated valley floors and hills, cradled between the Dixie National Forest. Climate is largely determined by local topography and the location of the area relative to the principal sources of moisture, the Pacific Ocean and the Gulf of Mexico. The existence of barriers between southern Utah and these moisture sources produces the dry temperature climate for which this area is renowned. A weather station was constructed in the summer of 2005 to monitor, monthly, precipitation, Temperature, Wind direction and speed, and is shown in Photographs 4-1 and 4-2.

Winter season Pacific storms reaching the Utah area must first cross the Sierra Nevada and Cascade Ranges to the west. Lifting of the air masses during passage over these barriers result in the majority of the moisture in the air condensing and falling out as precipitation. Thus, air mass reaching southern Utah from the west is generally dry and the associated precipitation is light. A similar barrier to moisture from the Gulf of Mexico can be found in the Rocky Mountains east of southeast Utah. During the summer, moist air masses do move into the southern part of Utah from the Gulf of California. Precipitation usually falls as thundershowers associated with these air masses. Precipitation for the area generally averages 16 inches per year. Temperature varies from a mean maximum temperature of 92 degrees during the summer months to a mean minimum temperature of 18 degrees during the winter months. Maximum snow depths average about 12" but usually melt fairly rapidly.

The predominant wind direction of south-central Utah ranges from southwest through west, with secondary peaks from the southeast and northwest. Surface winds near the

permit area average about eight miles per hour. Higher wind speeds are usually associated with the passage of frontal systems or thunderstorms, generally during the springtime.

411.100 Premining Land Use Information

The premining use of the land within the permit boundaries is grazing, and wildlife habitat.

Rangeland use for cattle grazing is the predominant land use in the Alton Coal area. Together with lands too steep or unproductive for cattle grazing, these two lands account for 90% of land commitments.

The land within the permit area consists of unmanaged expanses of rolling to steep Pinion-Juniper landscapes, sagebrush and mountain brush, meadow, and pasture land. Some cattle grazing occurs within the pastureland, but is limited due to the short growing season.

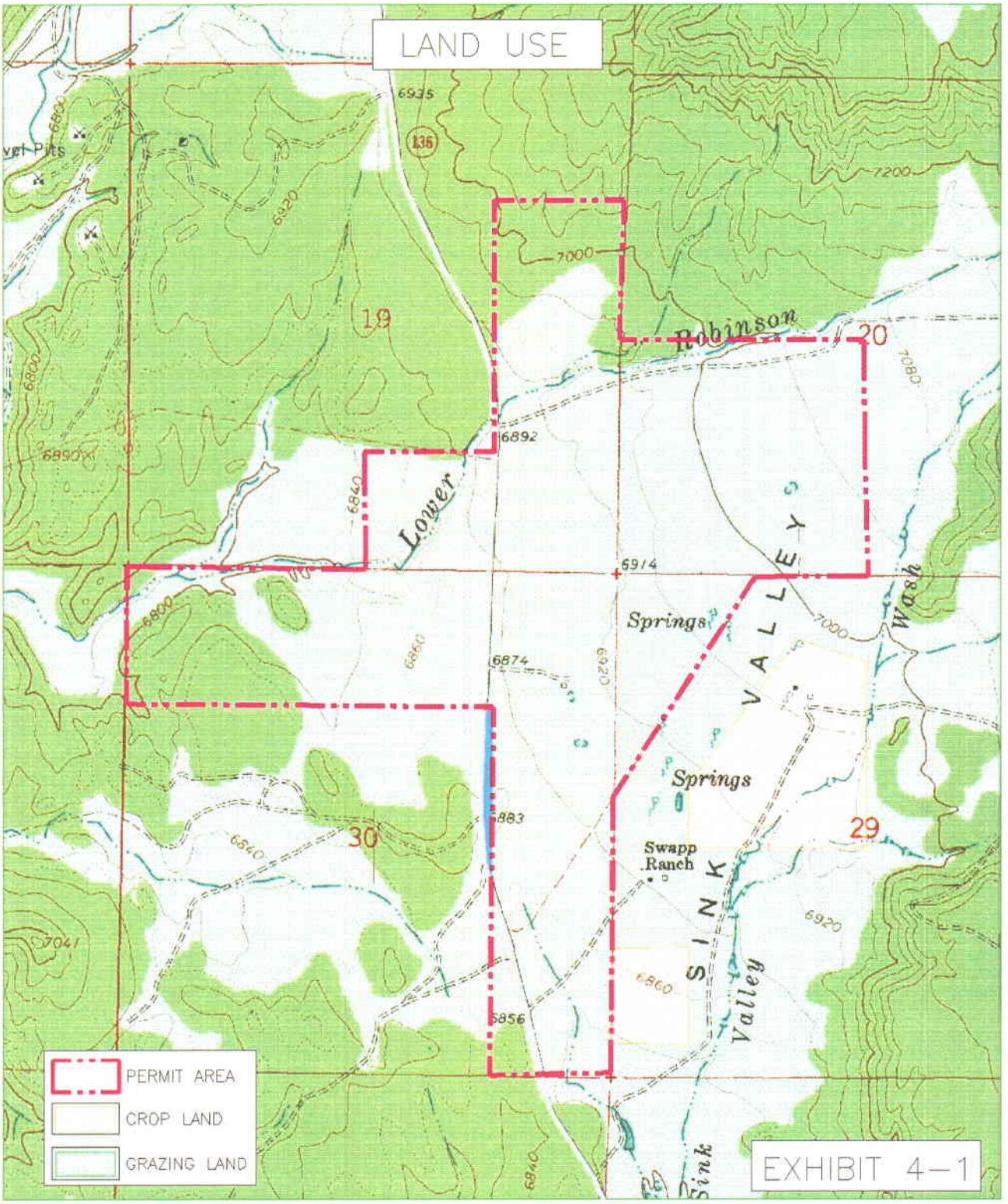
Agricultural crop production is sustained on some land east of the permit area. 85% to 90% of this crop is not harvested, but is used for cattle grazing. Crop lands located north of the permit area and south of Alton are devoted to hay production for on-ranch winter cattle feed. Exhibit 4-1 reflects land use within and around the permit area. Photographs 4-3 and 4-4 show actual layout of Crop land and Grazing land.

Wildlife habitats within the mine area are reflected on Drawings 3-2 through 3-5. Black Bear, Rocky Mountain Elk, Mule Deer, and Greater Sage Grouse are some wildlife that uses the lands within the Permit area.

After reclamation, the mining area will be restored to support uses it was capable of supporting prior to mining. Vegetation will be restored to provide habitat and a food source for wildlife. Access roads, fence lines, and supporting structures will be reconstructed pursuant to the wishes of the surface landowner.

Utility corridors and other Right-of-ways

Kane County maintains a county road, County Road 136, which runs north-south through the western part of the permit area. This is reflected on Drawing 1-1. Alton Coal Development, under the direction and in corporation with Kane County, plans to temporarily relocate county road 136, east while mining operations commence to the west. This is reflected on Drawing 5-1. After mining is completed below the now existing road bed, the county road will be moved back to its original, permanent location and constructed as required by Kane County Road Department.


LAND USE
6935
136
7200
7000
19
20
Robinson
6892
Lower
6914
Springs
Wash
SINK VALLEY
6874
Springs
30
29
Swapp Ranch
6920
6860
7041
6856
Sink Valley
PERMIT AREA
CROP LAND
GRAZING LAND
EXHIBIT 4-1

411.110 Surface Land Status/Mine Plan Area

Ownership of the surface rights within and contiguous to the mine plan and permit area is shown on Drawing 1-3. The surface within the permit area is privately owned and leased by Alton Coal Development, LLC. The contiguous lands, outside the permit area, are administered by Bureau of Land Management, along with other private owners, as reflected on Drawing 1-3.

Alton Coal Development believes that the mining of the permit area will enhance the post-mining use of the land. Some gullies and rills will be eliminated. Drainages will be enhanced allowing a better use of land. Wildlife habitat will benefit from the planting and reclamation of lands for that purpose. Reclamation will be constructed to the final landform shown on Drawings 5-35 and 5-36.

411.120 Land Capability

The Coal Hollow Project Area has several land uses ranging from wildlife habitat to pasture land. Current vegetative cover and productivity of the plant communities in the permit area are shown in Chapter 3 (321.100 *through* 321.200). Soil resources information of the permit area is provided in Chapter 2 (222.100 *through* 222.400). Topography of the area is described in several chapters, but specifically in Chapter 6. Current hydrologic conditions of the permit and adjacent areas to the project are provided in Chapter 7.

411.130 Existing Land Uses/Land Use Classifications

Kane County has zoned the area within the permit boundaries and surrounding area as Agriculture.

411.140 Cultural and Historic Resource Information

A cultural resource inventory was conducted by Montgomery Archaeological Consultants Inc. (MOAC) in June 2005 for Alton Coal Development, LLC. The project area is located in the Sink Valley area in the Alton Amphitheater. This survey covers the entire permit area, approximately 433 acres, all of which are on private property.

The inventory resulted in the documentation of one previously recorded historic/prehistoric site, five previously recorded prehistoric sites, and nine new prehistoric sites. Five eligible sites will be affected by mining operations. These five locations will require a data recovery treatment plan.

Appendix 4-1, Cultural resource inventory of Alton Coal Developments Sink Valley-Alton Amphitheater Project Area, Kane County, Utah, reflects maps, photographs, and results of the inventory.

411.141 Cultural and Historic Resources Maps

Cultural and Historic Resource Maps are included in Appendix 4-1.

411.141.1 Boundaries of Public Parks

There are no public parks in the permit area. There are known archeological sites as reflected in the Montgomery survey, Appendix 4-1.

411.141.2 Cemeteries Located within 100 feet

No cemeteries exist within the permit area or within 100 feet of the permit area or within any adjacent area subject to potential impacts.

411.141.3 Trails, Wild and Scenic Rivers System

No trails or wild and scenic rivers or study area rivers exist within the permit area or areas of potential impact.

411.142 Coordination with the State Historic Preservation Officer

Coordination with the State Historic Preservation Officer (SHPO) will take place prior to any mining. Clearances will be obtained through SHPO by means of Phase Testing, a data recovery treatment plan, or other appropriate mitigation processes.

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.142.1 Adverse Impacts on publicly owned parks or places listed on the National Register of Historic Places.

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.142.2 Valid Existing Rights / Joint Agency Approval

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.143 Mining on Historical Resources

Alton Coal Development determines there will be no significant effects of mining on historical resources. Alton Coal Development proposes there will be no impacts on mining on human values, cultural or historical.

411.143.1 Collection of Additional Information

Alton Coal Development will continue to conduct field investigations when determined needed.

A map showing the survey area already investigated for archeological importance is included in Appendix 4-1.

411.200 Previous Mining

There has been no mining within the permit area.

412 RECLAMATION PLAN

412. Reclamation & Land Use

412.100. Postmining Land Use Plan

A description of the proposed land use following reclamation of the mined areas has been provided in this section of the MRP. The discussion includes the utility and capacity of the reclaimed land and the relationship of the proposed uses to existing land use policies and plans, as well as the desires of the current landowners.

412.110. Postmining land use will be achieved by following the detailed reclamation plan included in the MRP. The reclamation plan includes descriptions for structure removal, excess spoil and mine waste disposal, backfilling, compacting, and regrading (Chapter 5); soil handling and stabilization (Chapter 2); revegetation techniques (Chapter 3); measures to control sediments during mining and reclamation activities (Chapter 7).

412.120. Grazing Management Plans

Consultations have been conducted with all surface landowners of the permit area to provide comments in the plan and attain their expectations for the desired postmining land use. According to the landowners, grazing and wildlife habitat would be the desired postmining land use, with emphasis on grazing by domestic livestock in most of the pasture land areas (these areas are shown on Vegetation Map, Drawing 3-lb). An exception to this plan is that one area that is currently pasture land will be reseeded appropriately to provide additional habitat for sage grouse, a sensitive species in the area. More about this plan is provided below.

The two landowners of the permit area are: Richard Dame and Burton Pugh (see Land Ownership Map, Drawing 1-3). Descriptions of current management practices as well as future grazing plans for the postmining land use have been provided below.

Management Plan for Richard Dame Property

The portion of land in the permit area owned by Mr. Richard Dame currently provides forage for domestic livestock and some wildlife species. This land is comprised mostly of unirrigated pasture land but also supports some native stands of pinyon juniper and sagebrush communities (see Vegetation Map 3-lb).

Mr. Dame has expressed the desire to return his property to pasture land that focuses on domestic livestock, but also included some plant species for wildlife habitat. In doing so, the revegetation seed mix is composed primarily of native and introduced grasses and forbs, with no woody species to be planted (for the seed mixture refer to Chapter 3, Table 3-19).

The livestock currently sustained on Mr. Dame property are mostly cattle, with some horses. The animals are kept in the pastures from April through November of each year. A management plan to support this same postmining land use has been designed so that the property will adequately support the animals desired by the landowner and will not be over-grazed.

The management plan suggests that **1.125 animals/month/acre** could reasonably be sustained on the property. This figure was derived from the *Average Animal Weight Method* (Pratt and Rasmussen) and is based on raising 1 cow weighing 1,000 lbs and her calf on pastures that have an annual biomass productivity of 1,800 lbs/acre. It conservatively estimates that one-half of the production will be consumed ("take half, leave half' rationale). Therefore, the total number of animals allowed on the property in the postmining land use management plan can be calculated by multiplying the estimated number of animals/month/acre by the number of pasture land acres available by the number of months the animals are maintained on a given pasture.

A copy of this management plan signed by the landowners along with their comments are provided in Appendix 4-3 and 4-4 of this chapter of the MRP.

Management Plan for Burton Pugh Property

The land in the permit area owned by Mr. Pugh also provides forage for domestic livestock and wildlife habitat. This land is comprised of unirrigated pasture land, meadows, sagebrush/grass, pinyon juniper, and oak brush communities (see Vegetation Map 3-lb). The livestock currently sustained on Mr. Pughes pasture land property are mostly cattle, but sometimes horses are kept on the property. The animals are supported in the pastures from April through November of the year. A management plan to support a similar postmining land use has been designed so that the property will not be over-grazed, yet support the animals desired by the landowner.

Following mining and reclamation activities, Mr. Pugh has expressed the desire for his land to be returned to its current or better condition for livestock and wildlife habitat.

In accomplishing this, the pasture lands will be revegetated to focus on domestic livestock, but the seed mixtures will also include some plant species used by the resident wildlife species. Because it has been postulated that encroachment of juniper trees into the valley in recent years has had a negative effect on the local sage grouse populations, the revegetation plan for these areas will also focus on other plant species, or species that could have a positive effect on the birds as well as provide good forage for domestic livestock. The revegetation seed mixes for the Pugh property are shown in Chapter 3 including: the sagebrush/grass (Table 3-17), meadows (Table 3-18), pasture lands (Table 3-19), oakbrush (Table 3-21), and pinyon-juniper communities (Table 3-23).

The management plan for Mr. Pugh suggests that **1.125 animals/month/acre** could reasonably be sustained on the property. This figure was derived from the *Average Animal Weight Method* (Pratt and Rasmussen 2001) and is based on raising 1 cow weighing 1,000 lbs and her calf on pastures that have an annual biomass productivity of 1,800 lbs/acre. It conservatively estimates that one-half of the production will be consumed ("take half, leave half' rationale). Therefore, the total number of animals allowed on the property in the postmining land use management plan can be calculated by multiplying the estimated number of animals/monthly acre by the number of pasture land acres available by the number of months the animals are maintained on a given pasture.

There is, however, one area within Mr. Pughes' property that currently supports pasture land, but once it is reclaimed, it will be seeded to a mixture that would be conducive to sage grouse enhancement. This field can easily be located on Drawing 3-lb because it is the only pasture land located west of the county road. This land will be seeded with the sagebrush/grass mixture (Chapter 3, Table 3-17).

A copy of this management plan signed by the landowners along with their comments have been provided in the Appendix 4-3 and 4-4 of this chapter of the MRP.

412.130. Post-Mining Land Use Changes

With the exception of improvement of the current pasture lands, and the area mentioned above that will be seeded with plant species that enhances sage grouse habitat, there will be no changes from the pre-mining land use for the postmining land uses.

412.140. Land Use Considerations

Considerations for postmining land use have been made by consulting with the surface landowners for the pasture lands as well as the native plant communities that will be impacted by the mining activities. The landowners have special concerns regarding plant species for livestock and others for wildlife. Basically, the pasture lands will be planted with grass and forb species good for livestock and wildlife

species, and will not include any woody species. At final reclamation, the natural plant communities disturbed by mining will be seeded with native plants, some of which will have special considerations for habitat improvement for the sensitive bird, sage grouse.

Additionally, considerations were made to insure compliance with all state and federal regulations for postmining land use and reclamation. For example, all plant communities that will be impacted by mining will quantitatively sampled beforehand and compared to similar communities that will not be affected. The unaffected communities will remain undisturbed and will be used as "reference areas", or future standard for revegetation success at the time of final reclamation. Nonetheless, reference areas for the pasture lands will also be established for revegetation success standards.

412.200. Land Owner or Surface Manager Comments

The postmining land use plans that have been signed by the landowners and are included in the appendix of this chapter. Also included is a page for "Comments" by the landowners.

412.300. Suitability and Compatibility

The final fills containing excess spoil will be suitable for reclamation and revegetation and are compatible with the natural surroundings and the approved postmining land use. The final fill slopes will be regraded to a maximum angle of 3h: 1v (33 percent). The slopes will be revegetated and drainage will be established in a manner similar to the original flow patterns. These slopes will be suitable for grazing and wildlife habitat. The design for this excess spoil and the final landform can be viewed on Drawings 5-35 and 5-36. The construction and reclamation practices for the excess spoil are further explained in Chapter 5.

413 PERFORMANCE STANDARDS

413.100. Postmining Land Use

All disturbed areas will be restored in a timely manner to conditions that are capable of supporting the uses that were present before any mining occurred. In some cases improvement of the land will be achieved (see Postmining Land Use Plan above).

413.200. Determining Premining Uses of Land

The pre-mining uses of land in which the postmining land use is compared have been previously described (see Postmining Land Use Plan above).

413.300. Criteria for Alternative Postmining Land Uses

Other than improvements to the existing land described above, the land will be returned to its pre-mining conditions.

420 AIR QUALITY

421 CLEAN AIR ACT

Coal mining and reclamation operations will be conducted in compliance with the requirements for the Clean Air Act and Any other applicable Utah or Federal statutes and regulations containing air quality standards.

422 UTAH BUREAU OF AIR QUALITY

Alton Coal Development, LLC has retained JBR Environmental Consultants to prepare a Notice of Intent (NOI) for a new source at the Coal Hollow Project. This application has been completed and was submitted on May 8, 2007. JBR has been coordinating preparation of the NOI with Tom Bradley and Jon Black of the Utah Division of Air Quality. A copy of the NOI is included as part of this application as Appendix 4-2. Upon approval of the NOI, the Executive Secretary of the Utah Air Quality Board will issue an Approval Order for a new source, which must be obtained before mine construction proceeds.

423.100- 200 AIR POLLUTION CONTROL PLAN

Production rates at the Coal Hollow Mine are expected to exceed 1,000,000 tons of coal per year. The Notice of Intent provided as Appendix 4-2 includes proposed air pollution controls and monitoring. This document includes sections detailing Best Available Control Technology Analysis, Air Pollution Control Equipment Information, Limitations/Test Procedures and Federal Limitations/Requirements.

The Coal Hollow Mine will utilize the following methods for controlling fugitive dust emissions in the active mining areas:

- Temporary topsoil and subsoil stockpiles: These piles will be seeded with a temporary seed mix to stabilize soils for protection against wind erosion and dust emissions.

- Reclamation: Reclamation surfaces will be revegetated at the earliest, practical opportunity. Seeding of the reclaim are planned to occur in the fall and spring. ACD plans to minimize the active mining surface area exposed at any one time by dividing the project area into small, manageable pits that can be reclaimed concurrently with mining operations. Drawings 5-17 through 5-19 and 5-38 detail the anticipated steps for the reclamation sequence within the project area.

Mulch will be placed on the seedbed surface once soil amendments have been incorporated and seeding has been accomplished in areas that will be reclaimed to native plant communities (areas used for pasture lands will not be mulched). The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Like the seeding methods, mulch will be applied with a variety of techniques and materials depending on the reclaimed area.

- Roads: All unpaved roads and other unpaved operational areas that are used by mobile equipment shall have water sprayed and/or chemically treated to control fugitive dust emissions. Road surfaces will be graded to stabilize/remove dust-forming debris as required. Areas adjoining primary roads will be stabilized and vegetated as required. Mobile equipment speeds will be controlled to minimize dusting conditions. Speed limits will be posted along all primary haul routes.
- Active Pit Areas: Inherent moisture in the overburden and coal will provide significant fugitive dust control in active mining and overburden removal areas. Should emissions from the active areas exceed the limitations described in Appendix 4-2, water will be applied to these areas as necessary to comply with these standards. Cleared vegetation debris within the mine area will be disposed of by placement in pit backfills.

For details related to air quality monitoring and data evaluation refer to Appendix 4-2, Pages 8 through 10.

424 PLAN FOR FUGITIVE DUST CONTROL PRACTICES

Proposed mining will exceed 1,000,000 tons annually. Appendix 4-2 and the preceding text contains information related to fugitive dust control practices and proposed air quality monitoring.

PHOTOS R645-301-411.100
Pre-mining Land use Information

Photograph 4-3
Cropland foreground with Grazing Land Around (view to the north)

Photograph 4-4
Cropland in the background, Grazing Foreground (view to the south)

PHOTOS R645-301-411
Environmental Description

Photograph 4-1
Weather Station Location: Constructed Summer 2005
Monitored Monthly, Wind, Precipitation, and Temperature

Photograph 4-2
Weather Station Location, in clearing (view SE)

APPENDIX 4-2

NOTICE OF INTENT- ALTON COAL LLC, COAL MINE & WASTE COALSIZING/STOCKPILING FACILITY-COAL HOLLOW MINE

By: JBR Environmental Consultants, Inc.

Alton Coal Development, LLC

Notice of Intent to Process Coal from Surface Mining
Coal Hollow Mine – Coal Sizing & Stockpiling Facility
Kane County, UT

Submitted on
May 8, 2007

to

Utah Division of Air Quality
150 North 1950 West
Salt Lake City, UT 84114

Prepared by:

jbr environmental consultants, inc.

8160 South Highland Drive
Sandy, UT
(801) 943-4144

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION AND OVERVIEW

Alton Coal Development, LLC (Alton) is filing this Notice of Intent (NOI) as an initial application for an Approval Order (AO) to operate a sizing and stockpile facility for a surface coal mine at a location in Kane County, Utah. The Coal Hollow Mine will be located in Sections 19, 20, 29, and 30 of Township 39 S, Range 95 W; south-southeast of Alton, Utah.

With respect to calculated emissions, Alton has included spreadsheets based on processing activities rather than individual pieces of equipment. Process-based emission calculations present the most accurate assessment of overall emissions at the location. Any ambient air quality impacts from emissions generated by the equipment at the processing plant are discussed in Section 6.0 – Ambient Air Quality Impact Analysis.

2.0 GENERAL FACILITY INFORMATION

Alton's Coal Hollow Mine - Coal Sizing & Stockpile Facility will be located in Sections 19, 20, 29, and 30 of Township 39 S, Range 95 W, Kane County, Utah. The corresponding Universal Transverse Mercator (UTM) Datum NAD27, Zone 12 coordinates are:

Northing: 4140699 meters
Easting: 371534 meters

A location map of the site, as well as a proposed facility layout, is given in Appendix A.

2.1 UDAQ General Information

The required UDAQ General Information Form is given in Appendix B. The requested Appendix designations have been changed to Section or Subsection designations to be consistent with the format of this NOI.

3.0 PROCESS INFORMATION

The Coal Hollow Mine will be a typical surface coal mining operation. The coal sizing plant will be similar to a sand and gravel operation, with crushing/sizing, screening, and stockpiling. At the mine, the coal will be excavated and placed into haul trucks. Haul trucks will transport the coal to the on-site processing plant, where it will be dumped into a hopper/crusher system to feed a stacker belt. The stacker will feed a coal stockpile to a maximum of 150,000 tons. The stockpile will have chutes beneath it that will feed coal via a beltline to a truck load-out facility. The requested equipment includes one feeder breaker, one roll crusher, one stacker belt, and miscellaneous mobile equipment. Sources of emissions from the site include emissions from the coal sizing/crushing process, haul traffic, wind erosion and fuel combustion.

The primary operation at this site will be coal processing for sizing. The operation involves crushing, screening, and storage of coal. A process flow diagram is included in Appendix C. A brief description of the processes at the processing plant is listed below.

3.1 Sizing Operations

Sizing/Sorting Process – This operation involves crushing/breaking, screening, conveying, and stockpiling. Material is extracted at the mine using hydraulic excavators and delivered to the processing plant by haul trucks. The material is sized by a feeder breaker which is a round shaft with bits attached that spins across the coal to break the coal. One or more conveyors transfer the broken up coal to the roll crusher and from the roll crusher to the stacker belt and into the stockpile.

Hauling – The material is transported to the processing plant via end dump and belly dump haul trucks. Highway approved haulage trucks take the finished product 113 miles off site for transport by rail.

3.2 Process Equipment and UDAQ Equipment Forms

With the submittal of this NOI, Alton proposes to permanently operate the equipment shown in Table 3.2-1.

Table 3.2-1 – Coal Hollow Mine Processing Plant Equipment and Production

Equipment Type	Number at Location	Production	
		Hourly	Annual**
Secondary Crusher (Feeder Breaker)	1	1200*	2,000,000
Secondary Crusher (Roll Crusher)	1	1200*	2,000,000
Conveyors	6	1200*	2,000,000
Emergency Diesel Generator	1	Capacity 500kW	>250
Fuel Tanks		**Capacity**	**Total Capacity**
Diesel Storage Tanks	2	12,000 gallons	24,000 gallons
Gasoline Storage Tank	1	4000 gallons	4000 gallons

* tph, tons per hour
** tpy, tons per year

With this installation, Alton anticipates a maximum of 10 drop points to accommodate the crushing system. Alton requests flexibility in hourly operation limitations to 24 hours per day and with that flexibility will not exceed the annual production limits given in Table 3.2-1. This approach is necessary as maximum hourly production is not always possible.

The required UDAQ forms for rock crushing equipment and internal combustion engines are given in Appendix D.

4.0 EMISSIONS RELATED INFORMATION

Emissions from the coal mining, sizing, and stockpiling operation are calculated on the basis of activities and throughput rather than the size or capacity of equipment. Emission factors for processing and loading/unloading are expressed in terms of pound of pollutant per ton of material processed[1]. Emission factors for stockpile wind erosion are expressed in terms of pound of pollutant per acre. Emission factors for combustion devices are expressed in terms of pound of pollutant per horsepower capacity per hour of operation.

Short-term emission rates are expressed in terms of pound of pollutant per hour and long-term emission rates are expressed in terms of ton of pollutant per year. The short-term rates are based on maximum hourly production, while long-term rates are based on maximum annual production, as given in Table 3.2-1.

The only point source emissions at the facility will be from the internal combustion engine; all other particulate emissions are considered fugitive emissions.

The spreadsheets in Appendix E give calculated emissions for each of the following activities:

- Product sizing, including controlled[2] crushing, screening, and conveyor transfers or drop points,
- Material removal (coal, topsoil and overburden),
- Stockpile loading/unloading,
- Dozing and dumping of material (coal),
- Stockpile and disturbed area wind erosion,
- Combustion devices,
- Fugitive emissions from haul road traffic.

The subsequent uncontrolled and controlled Potential To Emit (PTE) emissions from all processes are given in Tables 4.0-1 and 4.0-2. The emissions shown are based on mining over a rolling 12-month period and on operating the combustion devices over a rolling 12-month period.

[1] Process-specific emission factors are referenced on the individual emission calculation spreadsheets in Appendix E.
[2] Control means that the moisture content of the material being processed is greater than that specified in AP-42 for use of controlled emission factors; i.e., 2.88%.

Table 4.0-1 – Total Controlled PTE Emissions

Pollutant	Hourly Emission Rate (lb/hr)	Annual Emission Rate (tpy)
PM	67.66	132.33
PM_{10}	21.20	41.01
$PM_{2.5}$	0.68	1.46
NO_x	7.59	0.95
SO_2	0.95	0.12
CO	2.37	0.3
VOC	0.33	0.04
HAPs	insig	insig

Both uncontrolled and controlled emissions were evaluated to determine the status of the source. The uncontrolled emissions from each criteria pollutant are less than 100 tons per year (tpy), and thus the controlled emissions from each criteria pollutant are less than 100 tpy, classifying the source as minor. Uncontrolled annual emissions are based mainly on a throughput limitations as opposed to an hours per year. The uncontrolled emissions from each hazardous air pollutant (HAP) are less than 10 tpy, and the combination of all HAPs is less than 25 tpy, classifying the source as minor for HAPs.

5.0 AIR POLLUTION CONTROL EQUIPMENT INFORMATION

This section contains the required information for pollution control measures used on the types of equipment proposed for permanent installation in this NOI. In most cases, the analysis of Best Available Control Technology (BACT) is a summary of previously completed top-down analyses and/or the result of applying common industrial process knowledge for the type of control technology normally used on a particular piece of equipment.

5.1 Best Available Control Technology Analysis

BACT is typically identified by a "top-down" analysis in which engineering feasibility, economic impact(s), environmental impact(s), energy consumption, and cost considerations are applied to each potential technology category. BACT is the technology that emerges from the analysis as the best choice based on all considerations. For purposes of this NOI, a detailed and comprehensive "top-down" presentation is not necessary for the equipment proposed at the Coal Hollow Mine for two reasons:

1. The equipment is relatively simple and control technology options are limited.
2. Prior analyses and process knowledge have defined BACT categorically and reiteration of the analyses is not necessary.

Consequently, for each type of equipment covered in this NOI, BACT is identified, and the basis for the choice is discussed. These controls will be implemented at the facility for the existing equipment.

Sizing (Primary and Secondary)
Emissions from breaking/sizing operations are normally controlled by inherent moisture content and/or added moisture from water sprays. In the case of the processing plant, water sprays will not be in use as the moisture content of the material is 7-10%. This type of control constitutes BACT for sizing. The moisture inherent in the material adequately controls fugitive emissions generated by the sizing of materials. Baghouse technology can be applied; however, typically when baghouses are used on crushers they control emissions from numerous additional emission points (additional crushers, drop points, conveyor transfers, or screens). The economic and cost considerations would demonstrate that the application of baghouse technology to a single crushing circuit is cost prohibitive.

Conveying Operations (Feeder, Stacker, Conveyor Belt, etc.)
BACT for these process steps or operations is applied or inherent moisture. Feeders serve to channel the material from a bulk area to a smaller point. Emissions are minimal and the use of any other technology (dust collector, etc.) is impractical and ineffective because the pickup area is too great.

A stacker is an elevated conveying device that allows material to be stacked at different positions on a stockpile. The only emission points are transfer points onto the elevating belt and from the elevating belt onto the stockpile. In both cases, the fall distance is minimized, and the material transferred to the elevating conveyor is already moist. Additional water may be applied on an as-needed basis. For the drop from the stacker to the stockpile, moisture and drop distance minimization provide the best control.

Conveyor transfer points are locations at which processed material moves from one conveyor belt to another. Typically the transfers involve the drop of material a relatively small distance. Since the material on the conveyors is already moist from inherent and/or added moisture, fugitive emissions are already controlled, and additional controls are not necessary. Also, the conveyors that transport material from the stockpile to the trucks are located underground, beneath the stockpile.

For all sources of fugitive emissions in this category and covered in this NOI, inherent moisture is BACT. For reasons already discussed, baghouse technology is not appropriate. Additionally, when the incremental cost is considered, i.e., the differential cost per ton of pollutant removed between water application and baghouse technology, the cost is unreasonable.

Diesel-fired Emergency Generator
BACT for the combustion device is the use of low-sulfur diesel and proper operation and maintenance. This engine also meets EPA Tier II emission levels for diesel engines, which is considered BACT. The application of any add-on technology to control gaseous emissions is cost prohibitive.

6.0 AMBIENT AIR QUALITY IMPACT ANALYSIS

The NOI Guidance provided by UDAQ requires that NOIs for new facilities with emissions above pollutant-specific thresholds in NAAQS attainment areas be accompanied by air quality impact analyses.

6.1 Criteria Air Pollutants

This facility is located in an area of attainment for all criteria pollutants, so applicability of air dispersion modeling of primary pollutants is required for this installation. Table 6.1-1 identifies those primary pollutants, the PTE emissions for the facility, and the modeling thresholds. As indicated in the table, air dispersion modeling of PM_{10} is required. Since this new source is still in the initial phase, modeling was not completed at this time. As soon as site drawings, equipment configurations, and other site related procedures are finalized, modeling will occur. A modeling protocol will be developed and submitted to UDAQ.

Table 6.1-1– Modeling Thresholds

Pollutant	Facility Emissions PTE (TPY)	Modeling Threshold (TPY)
Point PM_{10}	0.12	15
Non-point PM_{10}	40.89	5

6.2 Hazardous Air Pollutants

The UAC R307-410-4 requires sources to compare proposed HAP emissions to the emissions threshold value (ETV). If the maximum hourly HAP emissions exceed the ETV, the HAP emissions must be modeled. The UDAQ Form 11 for combustion equipment reiterates the requirement for modeling of formaldehyde emissions.

The hourly emission rates of all HAPs are below the modeling threshold. Additional detail on this conclusion is given in the emission calculation spreadsheets in Appendix E.

7.0 REQUESTED CHANGES TO APPROVAL ORDER CONDITIONS

This section contains proposed language for the Approval Order (AO). The format of the proposed AO is the standard format used by UDAQ for other AOs. Alton anticipates that submitting draft AO language will assist UDAQ and allow for the expeditious issuance of the final AO.

General Conditions:

1. This AO applies to the following company:

   Site Office
   Directions to the Coal Hollow Mine: From Alton, UT, travel south on County Road 136 approximately 3 miles. Mine is located east of the County Road.

Corporate Office
Alton Coal Development, LLC
PO Box 1230
615 North, 400 East
Huntington, Utah 84258

Phone Number (435) 687-5310
Fax Number (435) 687-5311

2. All definitions, terms, abbreviations, and references used in this AO conform to those used in the Utah Administrative Code (UAC) Rule 307 (R307), and Title 40 of the Code of Federal Regulations (40 CFR). Unless noted otherwise, references cited in these AO conditions refer to those rules.

3. The limits set forth in this AO shall not be exceeded without prior approval in accordance with R307-401.

4. Modifications to the equipment or processes approved by this AO that could affect the emission covered by this AO must be approved in accordance with R307-401-1.

5. All records referenced in this AO or in applicable NSPS, which are required to be kept by the owner/operator, shall be made available to the Executive Secretary or Executive Secretary's representative upon request, and the records shall include the two-year period prior to the date of the request. Records shall be kept for the following minimum periods:

A. Emission inventories — Five years from the due date of each emission statement or until the next inventory is due, whichever is longer.
B. All other records — Two years.

6. Alton shall install and operate the aggregate processing equipment and shall conduct its operation of the Coal Hollow Mine in accordance with the terms and conditions of this AO, which as written pursuant to Alton's Notice of Intent submitted to the Division of Air Quality (DAQ) on April 26, 2007.

7. The approved installations shall consist of the following equipment:

Aggregate Plant
A. One (1) 270 ton per hour (tph) feeder breaker
B. Two (2) 270 ton per hour (tph) roll crusher(s)
C. Two (2) 270 tph stacker belt
D. One (1) Tier II diesel powered emergency generator, 500 kW capacity
E. Associated conveyors, stackers, etc.
F. Associated loaders, dozers, drills, etc.

8. Alton shall notify the Executive Secretary in writing when the installation of the equipment listed in Condition #7 has been installed and is operational, as an initial compliance inspection is required. To insure proper credit when notifying the Executive Secretary, send your correspondence to the Executive Secretary, Attention: Compliance Section.

   If installation has not been competed within eighteen months from the date of this AO, the Executive Secretary shall be notified in writing on the status of the installation. At that time, the Executive Secretary shall require documentation on the continuous installation of the operation and may revoke the AO in accordance with R307-401-11.

Limitations and Test Procedures

9. Visible emissions from the following emission points shall not exceed the following values:

   A. All crushers – 15%
   B. All screens – 10%
   C. All conveyor transfer points – 10%
   D. All diesel engines – 20%
   E. Conveyor drop points – 20%
   F. All other points – 20%

10. Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity. Visible emissions determinations for traffic sources shall use procedures similar to Method 9. The normal requirement for observations to be made at 15-second intervals over a six-minute period, however, shall not apply. Six points, distributed along the length of the haul road or in the operational area, shall be chosen by the Executive Secretary or the Executive Secretary's representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made one-half the vehicle length or greater behind the vehicle and at approximately one-half the height of the vehicle or greater. The accumulated six readings shall be averaged for the compliance value.

11. The following production limits shall not be exceeded:

    A. 2,000,000 tons of processed coal material per rolling 12-month period.
    B. 250 operating hours for the 500 kW diesel generator, per rolling 12-month period.
    C. 7,488 operating hours for the mine, per rolling 12-month period.
    D. To determine compliance with a rolling 12-month total, the owner/operating shall calculate a new 12-month total by the twenty-fifth day of each month using data from the previous 12 months. Records of production shall be kept for all periods when the plant is in operation. The records of production shall be kept on a daily basis. Hour of operation and production shall be determined by supervisor monitoring and maintaining of an operations log.

12. All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed and / or chemically treated to control fugitive dust. The application of water or chemical treatment shall be used except when the ambient temperature is below freezing (32°). If chemical treatment is used, it shall take place two (2) times a year and watering shall be initiated daily dependant upon observed dust generation. The opacity shall not exceed 20% during all times the areas are in use or unless it is below freezing. Records of water treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

    A. Date of application
    B. Number of treatments made
    C. Rainfall received, if any
    D. Time of day treatments were made

    Records of treatment shall be made available to the Executive Secretary or Executive Secretary's representative upon request and the records shall include the two-year period prior to the date of the request.

13. The haul roads shall not exceed 7900 feet combined, and the vehicle speed along the haul roads shall not exceed 15 miles per hour. The vehicle speed on the haul roads shall be posted, at minimum, on site at the beginning of each haul road so that it is clearly visible from the haul road.

14. The open or disturbed area shall not exceed limits set forth by the Division of Oil, Gas, and Mining without written consent from the Executive Secretary.

15. The storage piles and unpaved operational areas shall be watered to minimize generation of fugitive dusts as dry conditions warrant or as determined necessary by the Executive Secretary. The total area of coal storage piles shall not exceed 3.35 acres and overburden storage piles shall not exceed 60 acres.

Fuels

16. The sulfur content of any diesel fuel burned shall not exceed 0.5 percent by weight. Sulfur content shall be decided by ASTM Method D-4294-89 or approved equivalent. The sulfur content shall be tested if directed by the Executive Secretary.

Federal Limitations and Requirements

17. At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Executive Secretary which may include, but is not limited to, monitoring results, opacity observations, review of

operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded.

18. The owner/operator shall comply with R307-150 Series. Inventories, Testing and Monitoring.

19. The owner/operator shall comply with R307-107. General Requirements: Unavoidable Breakdowns.

The Executive Secretary shall be notified in writing if the company is sold or changes its name. Under R307-150-1, the Executive Secretary may require a source to submit an emission inventory for any full or partial year on reasonable notice.

This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including R307.

A copy of the rules, regulations and/or attachments addressed in this AO may be obtained by contacting the Division of Air Quality (DAQ). The Utah Administrative Code R307 rules used by DAQ, the NOI guide, and other air quality documents and forms may also be obtained on the Internet at the following web site: http://www.airquality.utah.gov

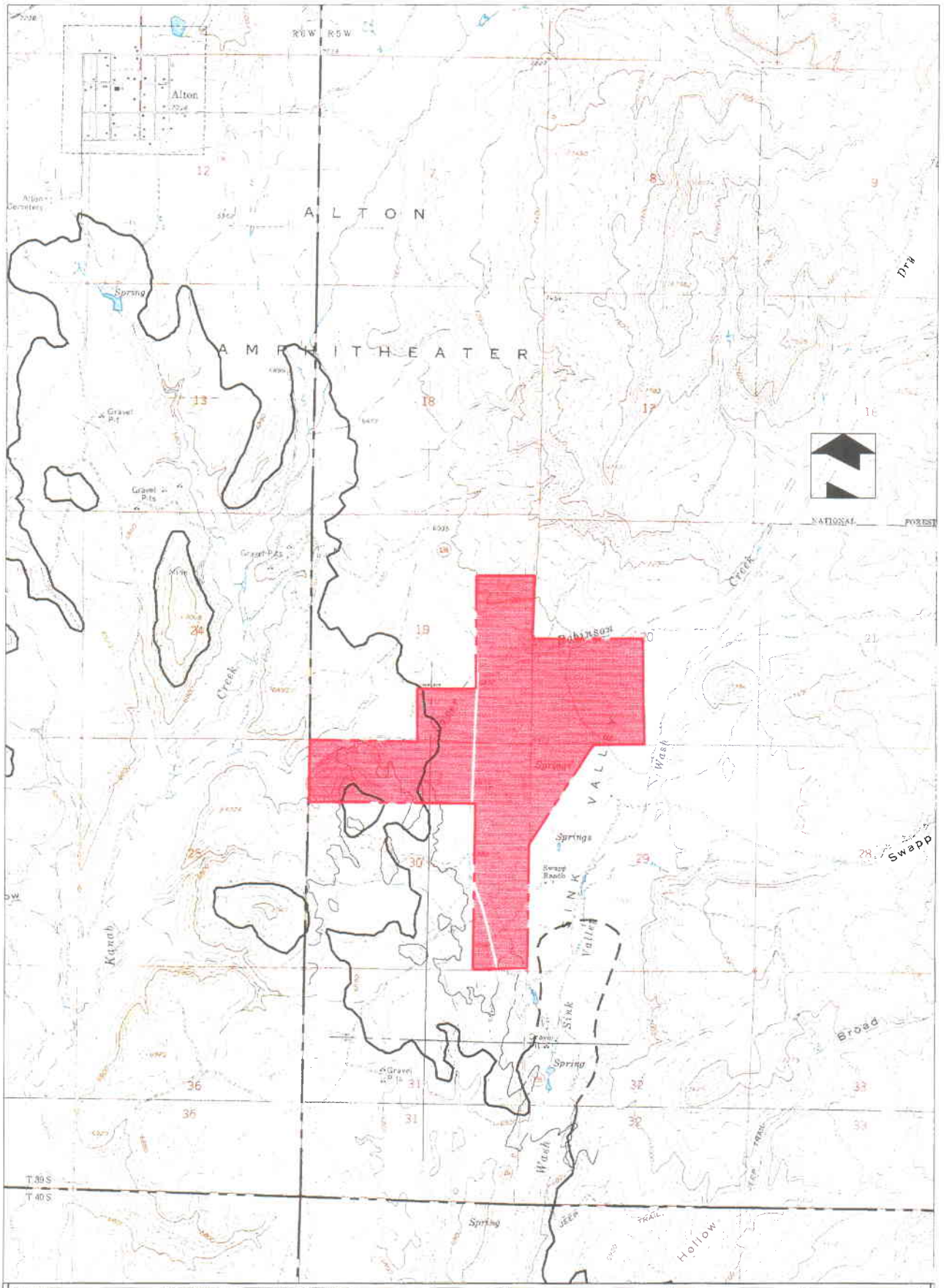
The annual emissions estimations below include point source, fugitive emissions, fugitive dust, road dust, etc. and do not include tail pipe emissions, grandfathered emissions, etc. These emissions are for the purpose of determining the applicability of Prevention of Significant Deterioration, non-attainment area, maintenance area, and Title V source requirements of the R307. They are not to be used for determining compliance.

The controlled PTE emissions for this source, Alton's Coal Hollow Mine, are currently calculated at the following values:

	Pollutant	Tons/yr
A.	PM_{10}	41.01
B.	SO_2	0.12
C.	NO_x	0.95
D.	CO	0.3
E.	VOC	0.04
F.	HAPs	insig

APPENDIX A

Location Maps
Proposed Facility Layout



LEGEND:	DRAWN BY:	CHECKED BY:
PROJECT AREA	N. BUTKOVICH	APC
COAL LINE BOUNDARY	DRAWING: 1-1	DATE: 8/16/04
COUNTY ROAD		SCALE: 1" = 1000'
	JOB NUMBER: 1400	SHEET

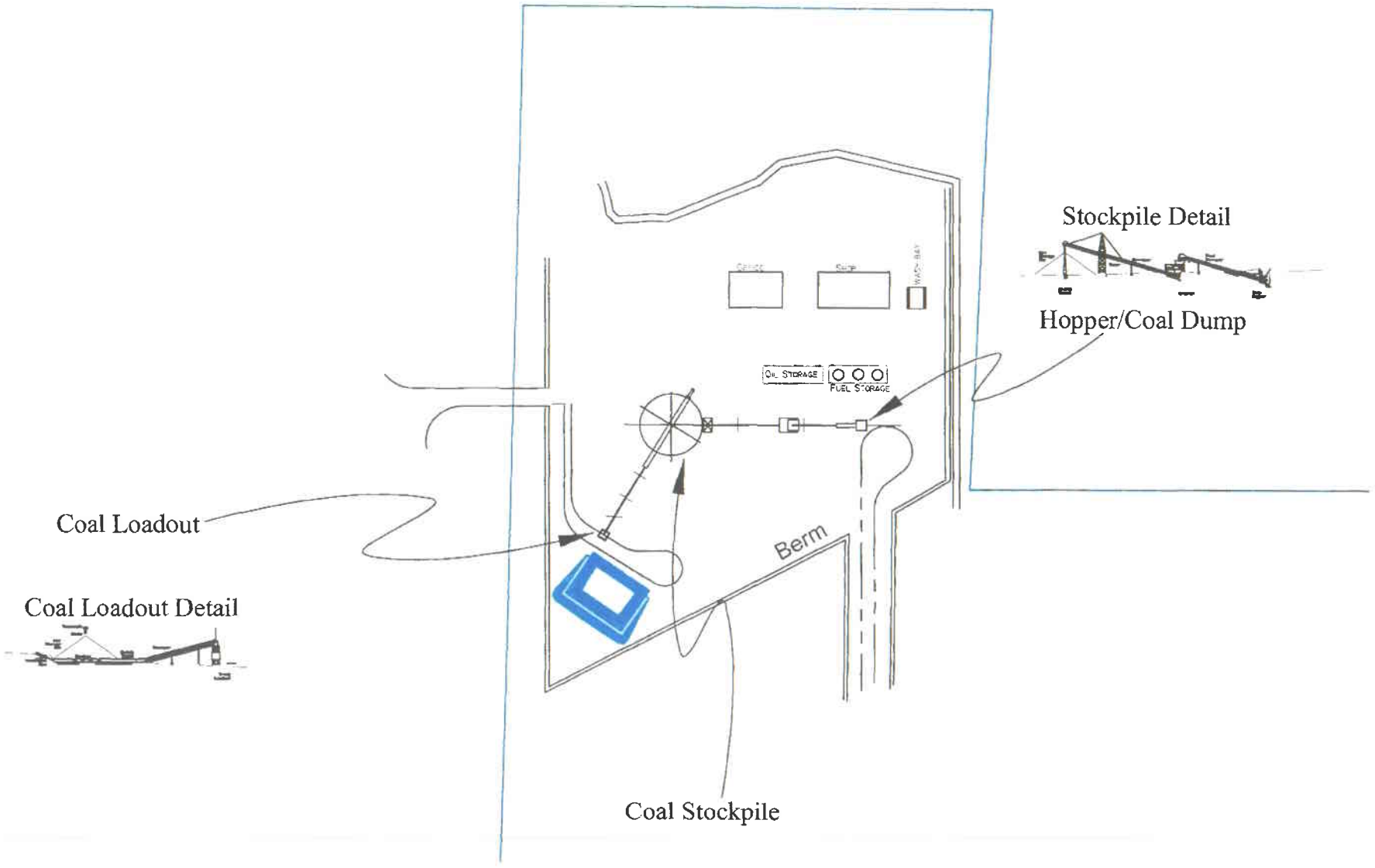
REVISIONS	
DATE:	BY:
9/13/04	NLB
3/6/06	NLB
4/27/06	NLB
5/18/06	NLB
6/6/06	NLB
2/21/07	NLB

PROJECT AREA

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 1-1

615 North 400 East
P.O. Box 1231
Huntington, Utah 84528
Phone: (435)687-5310
Fax: (435)687-5311


Stockpile Detail
Hopper/Coal Dump
OIL STORAGE
FUEL STORAGE
Coal Loadout
Berm
Coal Loadout Detail
Coal Stockpile

APPENDIX B

UDAQ Form 1 – General Information

Utah Division of Air Quality
New Source Review Section

Date: May 8, 2007

Form 1
General Information

Application for: ✗ Initial Approval Order ☐ Approval Order Modification

AN APPROVAL ORDER MUST BE ISSUED BEFORE ANY CONSTRUCTION OR INSTALLATION CAN BEGIN. This is not a stand alone document. Please refer to the Permit Application Instructions for specific details required to complete the application. Please print or type all information requested. All information requested must be completed and submitted before an engineering review can be initiated. If you have any questions, contact the Division of Air Quality at (801) 536-4000 and ask to speak with a New Source Review Engineer. Written inquiries may be addressed to: Division of Air Quality, New Source Review Section, P.O. Box 144820, Salt Lake City, Utah 84114-4820.

Applicable base fee for engineering review and filing fee must be submitted with the application.

General Owner and Facility Information

1. Company name and address:
Alton Coal Development, LLC
PO Box 1230
615 North 400 East
Huntington, Utah 84528

Phone No.: **(435) 687-5310**
Fax No.: **(435) 687-5311**

2. Company contact for environmental matters:
Chris McCourt
PO Box 1230
615 North 400 East
Huntington, Utah 84528

Phone No.: **(435) 687-5310**
Fax No.: **(435) 687-5311**

3. Facility name and address (if different from above):
Sections 19, 20, 29, and 30 of Township 39 S, Range 95 W; south-southeast of Alton

Phone no.: **NONE**
Fax no.: **NONE**

4. Owners name and address:

Same as 1.

Phone no.:
Fax no.:

5. County where the facility is located in:
Kane County

6. Latitude & longitude, and/or UTM coordinates of plant:
Northing: 4140699 meters
Easting: 371534 meters

7. Directions to plant or Installation (street address and/or directions to site) (include U.S. Coast and Geodetic Survey map if necessary): Drive south on US-89 for 32.2 miles turn left onto Alton Rd and proceed 3.6 miles to town of Alton, turn left onto Kane County Rd #136 and travel 4 miles. Continue on CR #136 for an additional to miles to the facility.

8. Identify any current Approval Order(s): **NONE**
AO#_____Date_____ AO#_____Date_____
AO#_____Date_____ AO#_____Date_____

9. If request for modification, permit # to be modified: **NA** Date **NA**

10. Type of business at this facility: **Coal Mine**

11. Total company employees greater than 100?

☐ Yes ✗ No

12. Standard Industrial Classification Code
1221 Bituminous Coal and Lignite Surface Mining

Approval Order Application
Form 1 (Continued)

13. Application for:
- ✗ New construction
- ☐ Existing equipment operating without permit
- ☐ Change of permit condition
- ☐ Modification
- ☐ Permanent site for Portable Approval Order
- ☐ Change of location

14. For new construction or modification, enter estimated start date: May 2008, Estimated completion date: January 2009

15. For change of permittee, location or condition, enter date of occurrence: **N/A**

16. For existing equipment in operation without prior permit, enter initial operation date: **N/A**

17. Has facility been modified or the capacity increased since November 29, 1969: Yes ☐ No **N/A**

Process Information

18. Site plan of facility **(See Section 3.0)**

19. Flow diagram of entire process to include flow rates and other applicable information **(See Section 3.0)**

20. Detailed written process and equipment description. **(See Section 3.0)**
Description must include:
Process/Equip specific form(s) identified in the instructions
Fuels and their use
Raw materials used
Production rates
Equipment used in process
Operation schedules
(including daily/seasonal variances)
Description of product(s)
Description of changes to process (if applicable)

21. Does this application contain justifiable confidential data? ☐ Yes ✗ No

Emissions Information

22. Complete and attach Form 1d, Emissions Information **(See Section 4.0)**
Include Material Safety Data Sheets for all chemicals or compounds that may be emitted to the atmosphere.

23. Identify on the site plan **(see Section 3.0)** all emissions points, building dimensions, stack parameters, etc.

Air Pollution Control Equipment Information

24. List all air pollution control equipment and include equipment specific forms identified in the instructions. **(See Section 5.0)**

25. List and describe all compliance monitoring devices and/or activities (such as CEM, pressure gages). **N/A**

26. Submit modeling for the project if required. **(See Section 6.0)**

27. Attach your proposal of what air pollution control devices, if any, or operating practices represents Best Available Control Technology. Discuss and evaluate all air pollution control technologies relevant to your situation or process. **(See Section 5.0)**

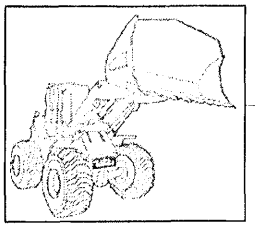
28. I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Title: **Engineer**

29. **Chris McCourt**	30. Telephone Number: **(435) 687-5311**	30. Date: **May 8, 2007**

APPENDIX C

Process Flow Diagrams



End Dump Haul Trucks

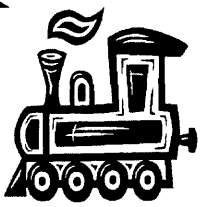
Feeder Breaker

CONVEYORS

SECONDARY CRUSHER

Stacker

STOCK PILE



APPENDIX D

UDAQ Form 11 – Internal Combustion Engines

UDAQ Form 15 – Rock Crushing and Screening

Utah Division of Air Quality
New Source Review Section

Date: **May 8, 2007**
Company: **Alton Coal Development , LLC.**
Site/Source: **Coal Hollow Mine**

Form 11
Internal Combustion Engines

Equipment Information	
1. Manufacturer: **"TBD"** Model no.: **"TBD"**	2. Operating time of Emission Source: average / maximum **0.5** Hours/day / **1** Hours/day **0** Days/week / **7** Days/week **0**Weeks/year / **52** Weeks/year
3. Manufacturer's rated output at baseload, ISO ____ hp or **500** Kw Proposed site operating range ____ hp or **500** Kw	
Gas Firing – Not Applicable	
4. Are you operating site equipment on pipeline quality natural gas: □ Yes □ No	
5. Are you on an interruptible gas supply: □ Yes □ No If "yes", specify alternate fuel: _____	6. Annual consumption of fuel: _____ MMSCF/Year
7. Maximum firing rate: _____ BTU/hr	8. Average firing rate: _____ BTU/hr
Oil Firing	
9. Type of oil: Grade number □ 1 ✗ 2 □ 4 □ 5 □ 6 Other specify _____	
10. Annual consumption: **"TBD"** gallons	11. Heat content: **"TBD"** BTU/gal
12. Sulfur content: **<0.5%** by weight	13. Ash content: **Trace** % by weight
14. Average firing rate: **"TBD"** gal/hr	15. Maximum firing rate: **"TBD"** gal/hr
16. Direction of firing: ✗ horizontal □ tangential □ other: (specify)	

Operation

17. Application:
- ✗ Electric generation
  _____ Base load _____ Peaking
- □ Emergency Generator
- □ Driving pump/compressor
- □ Exhaust heat recovery
- □ Other (specify) _____

18. Cycle
- ✗ Simple cycle
- □ Regenerative cycle
- □ Cogeneration
- □ Combined cycle

Emissions Data

19. Manufacturer's Emissions in grams per hour (lbs/hp-hr): **0.016** NO_X **0.005** CO **0.001** VOC **Unavailable** Formaldehyde. **Note: (AP-42 Factors)**

20. Attach manufacturer's information showing emissions of NO_x, CO, VOC, SO_x, CH_2O and PM_{10} for each proposed fuel at engine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM_{10}, parts per million by volume (ppmv) at actual conditions and corrected to dry, 15% oxygen conditions.

Method of Emission Control: NO ADDITIONAL CONTROL

□ Lean premix combustors □ Oxidation catalyst □ Water injection □ Other (specify)_____

□ Other low-NO_x combustor □ SCR catalyst □ Steam injection

Additional Information

21. On separate sheets provide the following:

A. Details regarding principle of operation of emission controls. If add-on equipment is used, provide make and model and manufacturer's information. Example details include: controller input variables and operational algorithms for water or ammonia injection systems, combustion mode versus engine load for variable mode combustors, etc. **NOT APPLICABLE**

B. Exhaust parameter information on attached form. **ATTACHED**

C. All calculations used for the annual emission estimates must be submitted with this form to be deemed complete. **SECTION 4.0**

D. All formaldehyde emissions must be modeled as per Utah Administrative Code R307-410-4 using SCREEN 3. **SECTION 6.0**

E. If this form is filled out for a new source, forms 1 and 2 must be submitted also.

INTERNAL COMBUSTION ENGINE
FORM 11 (continued)
EMISSION SOURCES

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this form.

AIR CONTAMINANT DATA							EMISSION POINT DISCHARGE PARAMETERS							
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM			AIR CONTAMINANT EMISSION RATE		UTM COORDINATES OF EMISSION PT. (6)			STACK SOURCES (7)				
										HEIGHT ABOVE GROUND (FT)	HEIGHT ABOVE STRUCT. (FT)	EXIT DATA		
NUMBER	NAME	COMPONENT OR AIR CONTAMINANT NAME (2)		CONC. (%V) (3)	LB/HR (4)	TONS/YR (5)	ZONE	EAST (METERS)	NORTH (METERS)			DIA. (FT)	VELO. (FPS)	TEMP. (^{o}F)
1	GENSET1	PM_{10}			0.949	0.12	12							
		NO_X			7.592	0.95	12							
		SO_2			0.949	0.12	12							
		CO			2.373	0.3	12							
		VOC			0.332	0.04	12							

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL is approximately 5,000 feet.
UTAH AIR CONSERVATION BOARD STANDARD CONDITIONS ARE 68^{o} F AND 14.7 PSIA.

General Instructions for this form.

1. Identify each emission; point with a unique number for this plant site on plot plan, previous permits and emission inventory questionnaire. Limit emission point number to 8 character spaces. For each emission point use as many lines as necessary to list air contaminant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are OK.
2. Typical component names are: air, H_2O, nitrogen, oxygen, CO_2, CO, NO_x, SO_x, hexane, particulate matter (PM_{10}), etc. Abbreviations are OK.
3. Concentration data is required for all gaseous components. Show concentration in volume percent of total gas stream.
4. Pounds per hour. (#/hr) is maximum emission rate expected by applicant.
5. Tons per year (T/Y) is annual maximum emission rate expected by applicant, which takes into account process operating schedule.
6. As a minimum applicant must furnish a facility plot plan drawn to scale showing a plant benchmark, latitude and longitude correct to the nearest second for the benchmark, and all emission points dimensioned with respect to the benchmark. Please show emission point UTM coordinates if known.
7. Supply additional information as follows if appropriate:
   (a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
   (b) Stack's height above supporting or adjacent structures if structure is within three "stack heights above ground" of stack.

Utah Division of Air Quality
New Source Review Section

Date May 8, 2007
Company: Alton Coal Development, LLC
Site: Coal Hollow Mine

Form 15
Rock Crushing and Screening

Equipment Information

1. Check the appropriate crushing operations used in your process:

Type of Unit **Feeder Breaker/Roll Crusher**
Manufacturer **"TBD"**
Model **"TBD"**
Date Manufactured **"TBD"**
□ Primary Crushing type □ Cone □ Jaw □ Ball
✗ Secondary Crushing type □ Cone □ Jaw □ Ball
□ Tertiary Crushing type □ Cone □ Jaw □ Ball
Screen Manufacturer
Model and Date Manufactured
Screen type and size (triple, double, or single deck)

2. Dust sources will be controlled as follows:

	No Control	Pre Soaked	Water Spray	Bag house	Other (explain)
□ Feed hopper	□	□	□	□	✗
□ All belt transfer points	□	□	□	□	✗
□ Inlet to all crushers	□	□	□	□	✗
□ Exit of all crushers	□	□	□	□	✗
□ All shaker screens	□	□	□	□	✗

OTHER – Inherent moisture with added moisture by water sprays as needed.

3. Water Sprays

Total Water Rate to nozzles (gal/min):	Nozzle pressure (psi):	Quantity of nozzles at each spray bar location:
NA	**NA**	**NA**

4. Maximum Plant Production Rate and Operating Hours:

2,000,000 tons/yr **270** tons/hr
7488 hrs/yr **24** hrs/day

5. Water sprays used on stockpiles?
□ Yes □ No

Stockpile size: **3.35 acres - coal**

6. Number of conveyor belt transfer and drop points:
Approximately 15 or less

APPENDIX E

Emission Calculation Spreadsheets

EMISSIONS SUMMARY

1st Year of Operation

Source		PM		PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		Total HAPs	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Secondary Crushing - Controlled	Fugitive	2.88	2.40	1.30	1.08	0.24	0.20										
Conveyor Transfers - Controlled	Fugitive	1.68	1.40	0.55	0.46	0.16	0.13										
Material Removal - Controlled	Fugitive	16.95	26.43	5.09	7.93												
Topsoil Removal	Fugitive	20.80	0.67	6.24	0.20												
Product Dumping - Controlled	Fugitive	1.40	5.24	0.00	1.57												
Product Stockpile Wind Erosion	Fugitive	10.55	46.22	3.17	13.87												
Active Disturbed Area Wind Erosion - Controlled	Fugitive	0.60	2.63	0.18	0.79												
Inactive Disturbed Area Wind Erosion - Controlled	Fugitive	1.75	7.67	0.85	3.72												
Haul Roads - Controlled	Fugitive	10.09	39.57	2.88	11.28	0.29	1.13										
Generator Emissions	Non-Fugitive	0.95	0.12	0.95	0.12			7.59	0.95	0.95	0.12	2.37	0.30	0.33	0.04		
Totals	**Fugitive**	**66.71**	**132.21**	**20.25**	**40.89**	**0.68**	**1.46**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Non-Fugitive	**0.95**	**0.12**	**0.95**	**0.12**	**0.00**	**0.00**	**7.59**	**0.95**	**0.95**	**0.12**	**2.37**	**0.30**	**0.33**	**0.04**	**0.00**	**0.00**
Total		**67.66**	**132.33**	**21.20**	**41.01**	**0.68**	**1.46**	**7.59**	**0.95**	**0.95**	**0.12**	**2.37**	**0.30**	**0.33**	**0.04**	**0.00**	**0.00**

EMISSIONS SUMMARY

Subsequent Years of Operation

Source		PM		PM_{10}		$PM_{2.5}$		NO_x		SO_2		CO		VOC		Total HAPs	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Secondary Crushing - Controlled	Fugitive	2.88	2.40	1.30	1.08	0.24	0.20										
Conveyor Transfers - Controlled	Fugitive	1.68	1.40	0.55	0.46	0.16	0.13										
Material Removed - Controlled	Fugitive	16.95	26.43	5.09	7.93												
Product Dumping - Controlled	Fugitive	1.40	5.24	0.00	1.57												
Product Stockpile Wind Erosion	Fugitive	10.55	46.22	3.17	13.87												
Active Disturbed Area Wind Erosion - Controlled	Fugitive	0.60	2.63	0.18	0.79												
Inactive Disturbed Area Wind Erosion - Controlled	Fugitive	1.75	7.67	0.85	3.72												
Haul Roads - Controlled	Fugitive	10.09	39.57	2.88	11.28	0.29	1.13										
Generator Emissions	Non-Fugitive	0.95	0.12	0.95	0.12	0.00	0.00	7.59	0.95	0.95	0.12	2.37	0.30	0.33	0.04	0.00	0.00
Totals	**Fugitive**	**46.85**	**131.54**	**14.01**	**40.70**	**0.68**	**1.46**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Non-Fugitive	**0.95**	**0.12**	**0.95**	**0.12**	**0.00**	**0.00**	**7.59**	**0.95**	**0.95**	**0.12**	**2.37**	**0.30**	**0.33**	**0.04**	**0.00**	**0.00**
Total		**47.80**	**131.66**	**14.95**	**40.81**	**0.68**	**1.46**	**7.59**	**0.95**	**0.95**	**0.12**	**2.37**	**0.30**	**0.33**	**0.04**	**0.00**	**0.00**

PRODUCT SIZING EMISSIONS

Sizing - Uncontrolled	Throughput		PM Emission Factor[1]	PM_{10} Emission Factor[1]	PM Emissions		PM_{10} Emissions	
	tph	tpy			lb/hr	tpy	lb/hr	tpy
Secondary Crushing (1-Breaker)	1200	2,000,000	0.0054 lb/ton	0.0024 lb/ton	6.48	5.40	2.88	2.40
Secondary Crushing (1-Roll Crusher)	1200	2,000,000	0.0054 lb/ton	0.0024 lb/ton	6.48	5.40	2.88	2.40
Conveyor Transfers[3]	1200	2,000,000	0.003 lb/ton/point	0.0011 lb/ton/point	36.00	30.00	13.20	11.00

Sizing - Controlled[4]	Throughput		PM Emission Factor[1]	PM_{10} Emission Factor[1]	$PM_{2.5}$ Emission Factor[1]	PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions	
	tph	tpy				lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Secondary Crushing (1-Breaker)	1200	2,000,000	0.0012 lb/ton	0.00054 lb/ton	0.00010 lb/ton	1.44	1.20	0.65	0.54	0.12	0.10
Secondary Crushing (1-Roll Crusher)	1200	2,000,000	0.0012 lb/ton	0.00054 lb/ton	0.00010 lb/ton	1.44	1.20	0.65	0.54	0.12	0.10
Conveyor Transfers[3]	1200	2,000,000	0.00014 lb/ton/point	0.000046 lb/ton/point	0.000013 lb/ton/point	1.68	1.40	0.55	0.46	0.16	0.13

[1] AP-42, 5th Edition, Table 11.19.2-2

[2] AP-42 footnotes indicate no data available for primary/secondary crushing, but emission factors for PM_{10} for tertiary crushers can be used as an upper limit for primary/secondary crushing.

[3] Assumption is that a maximum of 10 drop points are in use.

[4] Moisture content is 7-10%; above the moisture content for controlled crushing in the Emission Factor Reference provided.

Alton Coal Cow Hollow Mine **NOI**

Overburden Removal

	Controlled Emissions			Uncontrolled Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	2.08	16.49	24.70	4.16	32.99	123.50
PM10	0.62	4.95	7.41	1.25	9.90	37.05

Throughput Rates		
Hourly	2675.48	tons
Annual	20,034,000	tons

NOTE: 80% control

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.02 lb/ton*Tons/yr((365-P)/365))*0.75)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	18	Natural moisture percent
S=	Material silt content	6.9	Silt Content (AP-42 Table 11.9-6)
P=	number of days in a year with at least 0.01 inches of precip	65	Days
A=	annual hours of operations	7488	hours

Alton Coal Cow Hollow Mine

Coal Removal

	Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.06	0.46	1.73
PM10	0.02	0.14	0.52

Throughput Rates		
Hourly	270	tons
Annual	2,000,000	tons

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.003 lb/ton*Tons/yr((365-P)/365))*0.70)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	8.5	Natural moisture percent
S=	Material silt content	8.6	Silt Content (AP-42 Table 11.9-6)
P=	number of days in a year with at least 0.01 inches of precip	65	Days
A=	annual hours of operations	7488	hours

Total Emissions From Material Removal

	Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	2.14	16.95	26.43
PM10	0.64	5.09	7.93

Alton Coal Cow Hollow Mine **NOI**

Top Soil Removal

	Controlled Emissions			Uncontrolled Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	2.62	20.80	0.67	5.24	41.61	3.33
PM10	0.79	6.24	0.20	1.57	12.48	1.00

Throughput Rates		
Hourly	3375.00	tons
Annual	540,000	tons

NOTE: 80% control

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.02 lb/ton*Tons/yr((365-P)/365))*0.75)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	18	Natural moisture percent
S=	Material silt content	6.9	Silt Content (AP-42 Table 11.9-6)
P=	number of days in a year with at least 0.01 inches of precip	65	Days
A=	annual hours of operations	160	hours

Topsoil removal will take place during the fisrt month of operation and will be a one-time occurance as such the emission from the topsoil removal are only being accounted for in the first year of operation.

Product Dumping Emissions

Product Dumping Emissions	Controlled Emissions			Uncontrolled Emissions		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	0.18	1.40	5.24	0.35	2.80	10.48
PM10	0.00	0.00	1.57	0.00	0.00	3.14

Throughput Rates		
Hourly	270	tons
Annual	2,000,000	tons

NOTE: 50% control

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=((0.017 lb/ton*Tons/yr((365-P)/365))*0.75)/2000 WYO
PM10= TSP *0.3 WYO

Where

M=	Material moisture content	8.5	Natural moisture percent
S=	Material silt content	6.9	Silt Content (AP-42 Table 11.9-6)
P=	number of days in a year with at least 0.01 inches of precip	65	Days
A=	annual hours of operations	7488	hours

COAL STOCKPILE WIND EROSION EMISSIONS

Active Pile Emissions	Uncontrolled		
Pollutant	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	1.33	10.55	46.22
PM10	0.40	3.17	13.8660

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining
Where:

U= Wind Speed — 8 DAQ Default wind speed
OR
3.5 meters/sec

TSP= 1.2* (u) * 0.75
PM10 0.3 * TSP

Pile Size 3.35 Acre Assumes all piles active all the time
Usage 365 Days/year
8760 hrs/yr

TSP= 3.15 lb/acre-hr
PM10= 0.945

Active Disturbed Area Wind Erosion

Area: 70 acres

State of Wyoming Approved Emission factors
for fugitive dust emission sources from surface mining

TSP=0.25 Ton/acre/yr * acres * 0.75
PM10= 0.3 * TSP

Usage 365 Days/yr

Pollutant	Uncontrolled emissions		
	Grams/sec	Lbs/hr	Tons/yr
Total Particulate	0.378	2.997	13.13
PM10	0.113	0.899	3.94

Pollutant	Controlled emissions		
	Grams/sec	Lbs/hr	Tons/yr
Total Particulate	0.076	0.599	2.63
PM10	0.023	0.180	0.79

NOTE: 80% control

Inactive Storage Piles and other open areas

Area: 60 acres

AP-42 Sept 85
This section was not included in the Fifth Edition
Section 8 Mineral Products Industry
8.19 Construction Aggregate processing
8.19.1 Sand and gravel processing
Inactive storage piles

TSP=	3.5 lb/acre/day	Table 8.19.1-1
PM10=	1.7 lb/acre/day	Table 8.19.1-1
	80% Control Efficiency	

Usage 365 Days/yr

Pollutant	Uncontrolled emissions		
	Gr/sec	Lbs/hr	Tons/yr
Total Particulate	1.103	8.750	38.33
PM10	0.536	4.250	18.62

Pollutant	Controlled emissions		
	Gr/sec	Lbs/hr	Tons/yr
Total Particulate	0.221	1.750	7.67
PM10	0.107	0.850	3.72

UNPAVED HAUL ROADS

Unpaved Haul Roads	80% Controlled			Uncontrolled		
Pollutant	Gram/sec	Lbs/hr	Tons/yr	Gram/sec	Lbs/hr	Tons/yr
Total Particulate	1.27	10.09	39.57	6.36	50.45	197.85
PM_{10}	0.36	2.88	11.28	1.81	14.38	56.40
$PM_{2.5}$	0.04	0.29	1.13	0.18	1.44	5.64

PM=	(k((s/12)^0.7)((W/3)^0.45)*((365-P)/365)	Pounds per VMT
PM_{10}=	(k'((s/12)^0.9)((W/3)^0.45)*((365-P)/365)	Pounds per VMT
$PM_{2.5}$=	(k2((s/12)^0.9)((W/3)^0.45)*((365-P)/365)	Pounds per VMT

WHERE

k=	particle size factor 30 um from Table 13.2.2-2	4.9
k'=	particle size factor <10 um from Table 13.2.2-2	1.5
k2=	particle size factor <2.5 um from Table 13.2.2-2	0.15
s=	silt content default mean value page 13.2.2-2	8.4
W=	Mean vehicle weight (tons)	110
P=	number of days in a year with at least 0.01 inches of precip	65

PM=	15.867746	Lbs/VMT	(lbs per vehicle mile traveled)
PM_{10}=	4.5230358	Lbs/VMT	(lbs per vehicle mile traveled)
$PM_{2.5}$=	0.4523036	Lbs/VMT	(lbs per vehicle mile traveled)

VMT/YEAR= 24937

Length of road (ft)	7900	
Miles/Trip	1.5	Miles
Trips/year	16667	

HOURS OF OPERATION

Hours per day	24
Days per week	Varied
Weeks per year	Varied
Hours per year	7844

Materials and Trucks

Coal	
Material (tons/year)	2,000,000
Empty Weight (tons)	50
Loaded Weight (tons)	170
Mean Vehicle Weight	110
Trips/year	16667
% of Total Trucks	100%

AP-42 Fifth Edition Volume 1, Supplement E December 2003
Section 13 Miscellaneous Sources, 11/2006 Revision
13.2 Fugitive Dust Sources
13.2.2 Unpaved Roads

DIESEL COMBUSTION EMISSIONS

Combustion Source	kW	hp	Hours of Operation[2]	Emission Factors (lb/hp-hr)				
				PM_{10}[1]	NO_{x1}	SO_2[1]	CO[1]	VOC[1]
Generator Set[1]	500	474.50	250	0.002	0.016	0.002	0.005	0.001

Emissions

Combustion Source	kW	hp	Hours of Operation[2]	PM10		NOx		SO_2		CO		VOC	
				Lb/hr	TPY	Lb/hr	TPY	Lb/hr	TPY	Lb/hr	TPY	Lb/hr	TPY
Generator Set[1]	500	474.50	250	0.949	0.12	7.592	0.95	0.949	0.12	2.373	0.30	0.332	0.04

[1] Emission Factor Reference: AP-42, 5th Edition, Table 3.3-1

[2] Emergency use only

MODELING REQUIREMENT CHECK

Criteria Modeling Check	PM_{10} Fugitive**	PM_{10} Nonfugitive**	NO_X	SO_2	CO	Lead
Controlled Emission Rates (tons per year)	40.89	0.12	0.95	0.12	0.30	NA
Modeling Threshold (tons per year)[1]	5	15	40	40	100	0.60
Modeling Required:	YES	NO	NO	NO	NO	

HAP Modeling Check	Benzene	E-Benzene	Hexane	Isooctane	Methyl Chloroform	Toluene	Xylene	Formaldehyde
TVL (mg/m^3)[2]	1.6 Chronic	85.2 Chronic	176 Chronic	266 Chronic	1911 Acute	188 Chronic	435 Chronic	0.37 Acute
ETF (lb-m3/mg-hr)[3]	0.051	0.051	0.051	0.051	0.038	0.051	0.051	0.038
Modeling Threshold (lb/hr)	8.16E-02	4.35E+00	8.98E+00	1.36E+01	7.26E+01	9.59E+00	2.22E+01	1.41E-02
Controlled Hourly Emission Rate (lb/hr)[4]								
Modeling Required:	NO	NO	NO	NO	NO	NO	NO	NO

[1] R307-405-6

[2] From the NIOSH Pocket Guide

[3] Table 2 in R307-410-5(1)(c)(u)(i)(C).

[4] If the controlled hourly emission rate is greater than or equal to the modeling threshold, then modeling of that pollutant is required.

** Typically if either the fugitive or nonfugitive PM_{10} modeling thresholds are exceeded, UDAQ will require modeling for all PM_{10}.

APPENDIX F

Air Dispersion Modeling Protocol

Air Dispersion Modeling Documentation

(To be submitted at a later date)

APPENDIX G

Alton Precipitation Data

ALTON, UTAH

Period of Record General Climate Summary - Precipitation

Station:(420086) ALTON

From Year=1928 To Year=2006

	Precipitation							>=	>=	>=	>=	Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		0.01 in.	0.10 in.	0.50 in.	1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	1.79	9.15	1969	0	1948	2.28	25/1969	6	4	1	0	21.1	80.6	1993
February	1.79	7.95	1932	0	1961	1.96	Sep-76	6	4	1	0	19.2	75	1969
March	1.57	6.17	1938	0	1955	3.55	Mar-38	6	4	1	0	14.5	56.7	1991
April	1.05	3.9	1988	0	1962	2	27/1952	5	3	0	0	4.4	23	1965
May	0.84	2.96	1992	0.02	1972	1.85	28/1934	4	2	0	0	0.6	8	1965
June	0.56	2.67	1952	0	1939	1.72	26/1952	3	2	0	0	0.1	6.5	1993
July	1.42	3.78	1968	0	1944	1.85	13/1946	7	4	1	0	0	0	1928
August	1.74	4.81	1963	0	1944	2.05	29/1951	8	5	1	0	0	0	1928
September	1.49	7.97	1939	0	1953	2.4	19/1972	5	3	1	0	0	0	1928
October	1.43	7.48	2004	0	1944	2.9	21/2004	5	3	1	0	1.3	18.5	2004
November	1.23	5.72	1978	0	1929	3.32	Feb-87	4	3	1	0	6.6	41.7	1982
December	1.52	6.24	1966	0	1930	3.35	31/1951	5	4	1	0	15.4	58	1936
Annual	16.43	25.82	1969	5.48	1956	3.55	19380303	65	41	9	2	83.3	178	1993
Winter	5.1	17.65	1969	1	1981	3.35	19511231	17	12	3	1	55.7	179	1993
Spring	3.45	8.28	1938	0.55	1955	3.55	19380303	16	10	2	0	19.5	60.5	1952
Summer	3.73	7.04	1999	0.78	1962	2.05	19510829	18	10	2	0	0.1	6.5	1993
Fall	4.15	11.35	2004	0.36	1956	3.32	19871102	14	9	3	1	7.8	41.7	1982

Table updated on Feb 6, 2007

For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons

Winter = Dec., Jan., and Feb.

Spring = Mar., Apr., and May

Summer = Jun., Jul., and Aug.

Fall = Sep., Oct., and Nov.

APPENDIX 4-3

Management Plan with Burton Pugh Signature and Comments

By: Alton Coal Development, LLC

MANAGEMENT PLAN FOR
BURTON PUGH PROPERTY

The land in the permit area owned by Mr. Pugh provides forage for domestic livestock and wildlife habitat. This land is comprised of unirrigated pasture land, meadows, sagebrush/grass, pinyon-juniper, and oak brush communities (see Vegetation Map 3-1b). The livestock currently sustained on Mr. Pughes pasture land property are mostly cattle, but sometimes horses are kept on the property. The animals are supported in the pastures from April through November of the year. A management plan to support a similar postmining land use has been designed so that the property will not be over-grazed, yet support the animals desired by the landowner.

Following mining and reclamation activities, Mr. Pugh has expressed the desire for his land to be returned to its current or better condition for livestock and wildlife habitat. In accomplishing this, the pasture lands will be revegetated to focus on domestic livestock, but the seed mixtures will also include some plant species used by the resident wildlife species. Because it has been postulated that encroachment of juniper trees into the valley in recent years has had a negative effect on the local sage grouse populations, the revegetation plan for these areas will also focus on other plant species, or species that could have a positive effect on the birds as well as provide good forage for domestic livestock. The revegetation seed mixes for the Pugh property are shown in Chapter 3 including: the sagebrush/grass (Table 3-17), meadows (Table 3-18), pasture lands (Table 3-19), oakbrush (Table 3-21), and pinyon-juniper communities (Table 3-23).

The management plan for Mr. Pugh suggests that **1.125 animals/month/acre** could reasonable be sustained on the property. This figure was derived from the *Average Animal Weight Method* (Pratt and Rasmussen 2001) and is based on raising 1 cow weighing 1,000 lbs and her calf on pastures that have an annual biomass productivity of 1,800 lbs/acre. It conservatively estimates that one-half of the production will be consumed ("take half, leave half" rationale). Therefore, the total number of animals allowed on the property in the postmining land use management plan can be calculated by multiplying the number of animals/month/acre *by* the estimated number of pasture land acres available *by* the number of months the animals are maintained on a given pasture.

There is, however, one area within Mr. Pughes' property that currently supports pasture land, but once it is reclaimed, it will be seeded to a mixture that would be conducive to sage grouse enhancement. This field can easily located on Drawing 3-1b because it is the only pasture land located west of the county road. This land will be seeded with the sagebrush/grass mixture (Chapter 3, Table 3-17).

Mr. Pugh has reviewed the postmining contour proposed for his property as shown on Drawing 5-35. This drawing shows an excess spoil structure and a variance from original approximate contour. Mr. Pugh is in agreement that the variances from the original contour are suitable for his intended postmining land use for the property.

Burton Pugh

May 25, 2007
Date

APPENDIX 4-4

Management Plan with Richard Dame Signature and Comments

By: Alton Coal Development, LLC

MANAGEMENT PLAN FOR
RICHARD DAMES PROPERTY

The portion of land in the permit area owned by Mr. Richard Dame currently provides forage for domestic livestock and some wildlife species. This land is comprised mostly of unirrigated pasture land but also supports some native stands of pinyon-juniper and sagebrush communities (see Vegetation Map 3-1b).

Mr. Dame has expressed the desire to return his property to pasture land that focuses on domestic livestock, but also included some plant species for wildlife habitat. In doing so, the revegetation seed mix is composed primarily of native and introduced grasses and forbs, with no woody species to be planted (for the seed mixture refer to Chapter 3, Table 3-19).

The livestock currently sustained on Mr. Dame property are mostly cattle, with some horses. The animals are kept in the pastures from April through November of each year. A management plan to support this same postmining land use has been designed so that the property will adequately support the animals desired by the landowner and will not be over-grazed.

The management plan suggests that **1.125 animals/month/acre** could reasonably be sustained on the property. This figure was derived from the *Average Animal Weight Method* (Pratt and Rasmussen) and is based on raising 1 cow weighing 1,000 lbs and her calf on pastures that have an annual biomass productivity of 1,800 lbs/acre. It conservatively estimates that one-half of the production will be consumed ("take half, leave half" rationale). Therefore, the total number of animals allowed on the property in the postmining land use management plan can be calculated by multiplying the estimated number of animals/month/acre *by* the number of pasture land acres available *by* the number of months the animals are maintained on a given pasture.

[redacted]

C J Dame
Richard Dame

5-15-07
Date

COMMENTS (IF ANY) BY RICHARD DAMES

We would rather put grasses more suitable for cattle grazing - intermediate Brom - and wheat Crass.

talk to David Johnson.
H 365 Box 49
Moccasin az 86022
928- 643-7297

We don't want native Grasses.