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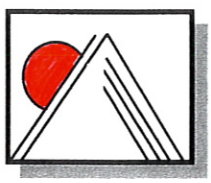

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R645-301-300. BIOLOGY

310. INTRODUCTION

The following section has been created to be submitted to the State of Utah, Division of Oil, Gas & Mining (DOGM). It describes specific biological resources of the Coal Hollow Project near the town of Alton, Utah. Updates to the data sets herein 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. Vegetation Mapping and Plant Community Data in the Permit Area

The first vegetation map prepared for the Coal Hollow Project delineated the plant communities that existed within the permit area. The plant communities for the permit area on this early map were drafted on a USGS quadrangle map using information from an existing vegetation map that was prepared from previous work in the area. The earlier work was accomplished in the late-1980s.

A new flight was conducted for the Coal Hollow Project in 2006 that provided aerial photography and more detailed information than 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 revised vegetation map where the plant communities were delineated on the new aerial photographs. Also, new quantitative data were recorded in 2006 in some of the first plant communities proposed for disturbance along with reference areas that would *not* be disturbed. This next version of the vegetation map for the Coal Hollow project also provided sample locations of these recently studied areas. This map was submitted to DOGM in the last MRP submittal (*dated May 25, 2007*) along with the first vegetation quadrangle map, because it continued to provide support for some of the older vegetation data also submitted in the MRP at that time.

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 quadrangle vegetation map corresponded to this early vegetation information. The early datasets were included in the MRP provided to DOGM (*submittal date: May 25, 2007*). Although this information was valuable at that time because it provided initial baseline data for that time period, plans to re-sample the same plant communities to update the existing data were made. Consequently, new quantitative sampling was accomplished later in 2007 to provide updated information about the plant communities within the permit area. The updated data have been summarized and included in this MRP. Therefore, with the 2006 and 2007 quantitative data for the plant communities submitted in the MRP, the dataset for those plant communities proposed for disturbance in the current mine plan for the entire permit area is complete. **Therefore, the older vegetation datasets and maps created using information from the late-1980s were replaced by the updated datasets and maps in the MRP**.

Reference areas chosen to represent future revegetation success standards were also chosen and sampled during the same sample periods in 2006 and 2007 as those proposed for disturbance by the mining operations.

Acreage of each plant community and map symbols shown on the revised Vegetation Map *(Drawing 3-1, dated 12/26/07)* for the Coal Hollow Project permit and adjacent areas are shown below.

Vegetation Communities of the Coal Hollow Permit Area			
MAP SYMBOL (see *Vegetation Map*, Drawing 3-1)	PLANT COMMUNITY	TOTAL ACREAGE	PERCENT OF TOTAL
S/G	Sagebrush/Grass	212.00	33.64
P	Pasture Land	192.00	30.48
P-J	Pinyon-Juniper	114.00	18.10
M	Meadow	69.00	10.95
OB	Oak Brush	40.00	6.35
RB/SB	Rabbitbrush/Sagebrush (Disturbed; previously Sagebrush/Grass)	3.00	0.48
	Total*	**630.00**	100.00

Color photographs of the plant communities within the Coal Hollow Project permit area are shown in **PHOTOGRAPHS** section near the end of this chapter.

The above plant communities exist within the boundaries of the Coal Hollow Project permit area and will be disturbed by the coal mining and related activities. Consequently, quantitative and qualitative data were recorded by sampling the plant communities in 2006 and 2007. For general, wide-angle views of the plant communities in the permit area, refer to Photographs 3-1, 3-2, 3-3 and 3-4.

[**NOTE**: The rabbitbrush/sagebrush community was not sampled for baseline data information. This small area represented less that one-half of one percent of the permit area. Moreover, it was a *previously disturbed* sagebrush/grass community. Therefore, standards of revegetation success at final reclamation will be the same as those outlined for the *undisturbed* sagebrush/grass plant communities described in this document].

As mentioned other areas with similar plant communities were sampled within or near the permit area that will *not* be disturbed by mine-related activities. These native plant communities were chosen to be used as future revegetation success standards at the time of final reclamation of the mine site. Therefore, the same methods and parameters were employed in the reference areas that were used to sample the areas proposed for disturbance. The areas with like-communities sampled (the proposed disturbed area and reference area) for each community type, were

compared statistically for their appropriateness as reference areas at this time. Similar comparisons (and additional comparisons) will also be conducted between the communities once the land is reclaimed. Complete results and methodologies used are shown in the final reports prepared from sampling these communities. These reports have been included in the appendices at the end of this chapter. The reports titles are: *Vegetation of the Sagebrush/Grass & Meadow Areas*: *2006* (**Appendix 3-2**) and *Vegetation Sampling in the Coal Hollow Project Area: 2007* (**Appendix 3-4**). Following is a summary of the results from sampling these communities.

Proposed Disturbed Sagebrush/Grass Community

One of the most common plant communities of the Coal Hollow permit area was sagebrush/grass (see *Vegetation Map*, *Drawing 3-1* and Photograph 3-5).

Sagebrush community types in the permit area can be dominated by either big sagebrush (*Artemisia tridentata*) or black sagebrush (*A. nova*). In the sagebrush/grass community that has been proposed for disturbance and sampled, both of these species were nearly equally represented. The dominant plant species as shown in the species cover table (Table 3-1) were big sagebrush, black sagebrush, jungrass (*Koeleria macrantha*), and Sandberg's bluegrass (*Poa secunda*).

The total living cover of this sagebrush/grass community was estimated at 54.73%, of which 52.40% of it was from understory cover and only 2.33% was from overstory [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)]. Woody species density was also measured; the total number of individuals per acre was estimated at 8,339 (Table 3-3).

Sagebrush/Grass Reference Area

The sagebrush/grass community chosen as a reference area to be used for future revegetation success standards was located northwest of the sagebrush/grass community that was proposed for disturbance, and just outside the permit area (see *Vegetation Map*, *Drawing 3-1* and Photograph 3-6).

This plant community will remain undisturbed and is similar to the proposed disturbed area. It had been chosen to be used for future revegetation success standards and had similar cover, composition, and woody species density. Cover and frequency by species of the sagebrush/grass reference area are shown on Table 3-4. The dominant shrub plant species here were big sagebrush and black sagebrush. The most common grass species were slender wheatgrass (*Elymus trachycaulus*), cheatgrass *(Bromus tectorum*), Kentucky bluegrass, and Sandberg's bluegrass.

The total living cover in the area was estimated at 60.50%, all of which was from understory cover [Table 3-5(A)]. Woody species dominated the composition at 61.48%, whereas grasses comprised 29.86%, and forbs 8.65% [Table 3-5(B)].

The total number of plants per acre in the woody species density measurements was 8,331 (Table 3-6). Big sagebrush and black sagebrush dominated the woody species in the density measurements.

Proposed Disturbed Meadow (Dry) Community

There are different meadow lands located within the permit area. These meadows have somewhat been differentiated on the *Vegetation Map (Drawing: 3-1)* which show them as "M (Dry)" compared to those that retain more soil moisture, or shown as merely as "M" on the map. The year 1 mining operations would disturb a dry meadow community on the west side of the permit area (see Photograph 3-7).

Quantitative sampling was conducted in this meadow. As shown on Table 3-7, 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 3-8 (A)]. The composition of the understory was 75.70% grasses (and grass-likes), 13.28% forbs, and 11.01% shrubs [Table 3-8 (B)]. The total number of plants per acre in the woody species density measurements was 817 (Table 3-9). Black sagebrush was the only woody species present in the density measurements.

Meadow (Dry) Reference Area

The dry meadow reference area was chosen outside the permit area, but in close proximity to the dry meadow proposed to be disturbed by the mine (see *Vegetation Map, Drawing 3-1* and Photograph 3-8). The dominate grass and grass-like species in the dry meadow reference area were wiregrass, sedge, and junegrass (Table 3-10). 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 3-11(A)]. The understory cover composition was comprised of 71.05% grasses (and grass-likes), 22.31% forbs and 6.64% shrubs [Table 3-11 (B)]. The total woody species density of the community was 1,481 plants per acre and was comprised exclusively of black sagebrush (Table 3-12).

Proposed Disturbed Pinyon-Juniper Community

Several areas proposed for disturbance by mining activities currently support pinyon-juniper plant communities. For a representative picture of these sample areas see Photograph 3-9. Pinyon-juniper communities were sampled in two areas. One such area, shown as the "Prop. Dist. Pinyon-Juniper Sample Area (North)" on the *Vegetation Map, Drawing 3-1*, is located on the east side of the permit area and *north* of another pinyon-juniper sample area. This is a site where mining activities have been planned during the first year of mining activities. Another pinyon-juniper sample area or the "Prop. Dist. Pinyon-Juniper Sample Area (South)" on the map, is located near the south boundary of the permit area and also *south* of the other pinyon-juniper sample area. Disturbance from mining-related activities of the south sample area have been planned during the third year of mining. These two datasets have been combined to show the final results of the sample data for the proposed disturbed pinyon-juniper community as a whole, but the data could easily be separated at a later time if for some reason it is desired.

Overstory cover of the pinyon-juniper community was represented by only two species in the sample quadrats, but was dominated by Utah juniper (*Juniperus osteosperma*) and followed distantly by pinyon pine (*Pinus edulis*). Understory cover was dominated by black sagebrush, followed by Utah juniper and pinyon pine (Table 3-13). Grasses were few and forbs were absent in the sample quadrats.

The total living cover of the pinyon-juniper community was 43.00%, of which 25.00% was from understory and 18.00% was from overstory species [Table 3-14 (A)]. The understory composition by lifeform in this community was comprised of 95.88 % woody species [Table 3-14 (B)]. Woody species density was measured at 2,657 individuals per acre (Table 3-15).

Pinyon-Juniper Reference Area

A reference area, or an area chosen to represent future revegetation success standards, was chosen and sampled in another pinyon-juniper plant community (see Photograph 3-10). This reference area will *not* be disturbed by the mining operations so it could be used for data comparisons following final reclamation at the mine site. The pinyon-juniper reference area was located near the *north* proposed disturbed pinyon-juniper community (see *Vegetation Map, Drawing 3-1*).

Like the above proposed disturbed community, the overstory cover of the reference area was dominated by Utah juniper followed by pinyon pine. Understory was also dominated by black sagebrush, Utah juniper and pinyon pine (Table 3-16). Again forbs were not present in the quadrats; grasses present were slender wheatgrass and squirreltail (*Elymus elymoides*).

The total living cover of the pinyon-juniper reference area was estimated at 39.00%, 11.50% of it was composed of overstory and 27.50% was understory cover [Table 3-17 (A)]. The composition of the understory in the pinyon-juniper reference area was calculated as 89.56% trees and shrubs and 10.44% grasses [Table 3-17 (B)]. Woody species density was dominated by black sagebrush and Utah juniper, but the total of all species was 4,215 individuals per acre (Table 3-18).

Proposed Disturbed Pasture Land Community

The areas called "pasture lands" in the text and maps of this document were plant communities that have been disturbed previously to artificially increase herbaceous cover and productivity for domestic livestock. Prior to pasture lands, these communities were probably native sagebrush/grass plant communities similar to those sampled and described in the 2006 report (*Vegetation of the Sagebrush/Grass & Meadow Areas: 2006*). Although differences occur between pastures due to grazing practices and species planted, representative pastures were sampled for this report (see Photographs 3-11 and 3-12). The sample areas were located near the center of the permit area (see *Vegetation Map, Drawing 3-1*). Again, different locations within this community were sampled, a *north* and a *south* area; and the data were combined for the summary tables in this report. The proposed disturbed pasture land (*north*) was an area proposed for disturbance by operations during the first year of mining activities. The proposed disturbed pasture land (*south*) was an area proposed for disturbance by operations in the second year of mining activities.

The sampling results for the north and south pasture lands indicate that the most common plant species by cover and frequency for the combined data were intermediate wheatgrass (*Elymus hispidus*), Kentucky bluegrass (*Poa pratensis*), black sagebrush (Table 3-19). The annual plant called poverty weed (*Iva axillaris*) was also common in the sample areas.

The total living cover, all of it from understory species, was 44.50% [Table 3-20 (A)]. The composition of the pasture lands consisted of 52.16% grasses, 30.19% shrubs and 17.64% forbs [Table 3-20 (B)]. Woody species density measurements show the woody species density to be 1,349 individuals per acre with the most common species being big sagebrush *(Artemisia tridentata*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and black sagebrush (Table 3-21).

Pasture Land Reference Area

Because the pasture lands were unnatural or comprised of non-native conditions, a native reference area to represent future revegetation success standards was not chosen. Appropriate standards of revegetation success will be developed using the site-specific knowledge gained by the landowners, regulatory agencies, as well as qualified botanists and wildlife biologists representing the coal company.

Proposed Disturbed Oak Brush Community

An oak brush community has been proposed for disturbance by future mining operations (see Photograph 3-13). This community was located in the northeast region of the permit area (*see Vegetation Map, Drawing 3-1*).

Overstory of this community was greater than the understory cover. The dominant overstory species by a wide margin was Gambel's oak (*Quercus gambelii*) with a 41.25% cover and was present in 85.00% of the samples. The dominant understory species were big sagebrush, snowberry (*Symphoricarpos oreophilus*) and Gambel's oak (Table 3-22).

The total living cover in the proposed disturbed oak brush community was estimated at 66.75%, 43.00% coming from overstory and 23.75% from understory plants [Table 3-23 (A)]. Woody species comprised 97.75% of the understory composition with the remaining 2.25% coming from grass species [Table 3-23 (B)]. Forbs were not present in the sample quadrats. Woody species density was estimated at 3,743 plants per acre and, like the cover results, the most common species consisted of snowberry, Gambel's oak and big sagebrush (Table 3-24).

Oak Brush Reference Area

A oak brush reference area was chosen to represent future success standards for revegetation (see Photograph 3-14). This reference area was located on the east side of the permit area *(see Vegetation Map, Drawing 3-1*). Like the proposed disturbed area it was chosen to represent, the reference area's cover was greater for overstory than that of the understory. The dominant overstory species by far was Gambel's oak. Dominant understory species were Gambel's oak, Kentucky bluegrass, Utah juniper, big sagebrush and snowberry (Table 3-25).

Overstory cover was estimated at 53.25%, whereas understory cover was 20.00%. The total living cover of those combined was 73.25% [Table 3-26 (A)]. Understory lifeform composition was comprised of 66.92% trees and shrubs and 33.08% grasses – no forbs were present [Table 3-26 (B)]. Woody species density was estimated at 2,092 plants per acre with the most common by a wide margin being Gambel's oak, but also consisted of snowberry, big sagebrush, Rocky

Mountain juniper (*Juniperus scopulorum*), pinyon pine and Utah juniper (Table 3-27).

Proposed Disturbed Meadow Community

Meadow areas in and adjacent to the project permit area have been studied (see *Vegetation Map, Drawing 3-1*). A dry meadow was mentioned above and reported in the 2006 document included in the MPR [*Vegetation of the Sagebrush/Grass & Meadow Areas: 2006* (**Appendix 3-2**)]. However, another meadow community that retains more soil moisture has also been proposed for disturbance due to the mining (see Photograph 3-15). The complete report for this study has been include in the appendix section of Chapter 3 [*Vegetation Sampling in the Coal Hollow Project Area: 2007* (**Appendix 3-4**)].

The dominant plant species by cover and frequency in this community were wiregrass, Missouri iris (*Iris missouriensis*) and Wood's rose (*Rosa woodsii*). For a list of all species present in the sample quadrats refer to Table 3-28. This meadow community had a total living cover of 86.00% [Table 3-29 (A)]. Of this living cover 51.58% of it were comprised grasses or grass-like species, 32.54% were forbs and 15.88% were shrubs [Table 3-29 (B)]. Woody species density of the community was 384 individuals per acre, all of which was Wood's rose (Table 3-30).

Meadow Reference Area

The reference area, or area chosen to represent future revegetation success standards, was located just outside the permit area (*Vegetation Map, Drawing 3-1;* Photograph 3-16). Similar species dominated this community as were represented in the proposed disturbed area, namely wiregrass, Missouri iris, Kentucky bluegrass (*Poa pratensis*) and Wood's rose (Table 3-31). The total living cover in the reference area was estimated at 88.50% [Table 3-32 (A)]. Composition here was calculated to be comprised of 51.57% grass and grasslike species, 37.38% forbs and 11.04% shrubs [Table 3-32 (B)]. Woody species density in this area was estimated at 2,226 plants per acre (Table 3-33).

Other Meadow Communities

Other meadow communities were studies outside the permit area (see *Vegetation Map, Drawing 3-1*). These areas will not be disturbed by mining activities – they were studied to provide more information about the meadows in the area to provide companion studies for other studies such as alluvial valley floor determinations. Results from these studies can be found in the Chapter 3 appendices [*Vegetation Sampling in the Coal Hollow Project Area: 2007* (**Appendix 3-4)**].

Table 3-1: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Sagebrush/Grass (S/G) 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
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

Table 3-2: Coal Hollow Project. Total Cover and Composition (2006).		
Sagebrush/Grass (S/G) 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 3-3: Coal Hollow Project. Woody Species Density (2006).

Sagebrush/Grass (S/G) 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 3-4: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Sagebrush/Grass (S/G) 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 3-5: Coal Hollow Project. Total Cover and Composition (2006).		
Sagebrush/Grass (S/G) Reference Area		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover (u)	60.50	13.03
Litter	13.05	4.81
Bareground	25.05	13.58
Rock	1.40	1.20
B. % COMPOSITION (u)		
Trees/Shrubs	61.48	17.01
Forbs	8.65	8.73
Grasses	29.86	14.18

Table 3-6: Coal Hollow Project. Woody Species Density (2006).

Sagebrush/Grass (S/G) 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 3-7: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Meadow (M) 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 3-8: Coal Hollow Project. Total Cover and Composition (2006).		
Meadow (M) Dry Proposed Disturbed		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover (u)	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 3-9: Coal Hollow Project. Woody Species Density (2006).

Meadow (M) Dry (Proposed Disturbed)	
SPECIES	**Individuals Per Acre**
Artemisia nova	816.75
TOTAL	**816.75**

Table 3-10: Alton Coal Project. Living Cover and Frequency by Plant Species (2006).

Meadow (M) 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 3-11: Coal Hollow Project. Total Cover and Composition (2006).		
Meadow (M) Dry Reference Area		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover (u)	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 3-12: Coal Hollow Project. Woody Species Density (2006).

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

Table 3-13: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Pinyon-Juniper (P-J) Proposed Disturbed	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
SHRUBS			
Juniperus osteosperma	16.75	18.66	55.00
Pinus edulis	1.25	5.45	5.00
UNDERSTORY			
SHRUBS			
Artemisia nova	17.50	14.87	70.00
Juniperus osteosperma	5.75	8.98	35.00
Pinus edulis	0.50	2.18	5.00
FORBS			
GRASSES			
Elymus elymoides	0.75	3.27	5.00
Elymus trachycaulus	0.50	1.50	10.00

Table 3-14: Coal Hollow Project. Total Cover and Composition (2007)		
Pinyon-Juniper (P-J) **Proposed Disturbed**		
A. TOTAL COVER	Mean Percent	Standard Deviation
OVERSTORY (o)	18.00	18.33
UNDERSTORY (u)	25.00	11.40
Litter	22.55	19.66
Bareground	48.40	17.18
Rock	4.05	2.27
TOTAL LIVING (o + u)	43.00	15.20
B. % COMPOSITION (u)		
Trees & Shrubs	95.88	13.26
Forbs	0.00	0.00
Grasses	4.13	13.26

Table 3-15: Coal Hollow Project. Woody Species Density (2007).

Pinyon-Juniper (P-J) **Proposed Disturbed**	
SPECIES	**Individuals Per Acre**
Artemisia tridentata	166.03
Artemisia nova	1627.12
Juniperus osteosperma	730.55
Pinus edulis	132.83
TOTAL	**2656.53**

Table 3-16: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Pinyon-Juniper (P-J) Reference Area	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
SHRUBS			
Juniperus osteosperma	9.00	13.56	40.00
Pinus edulis	2.50	10.90	5.00
UNDERSTORY			
SHRUBS			
Artemisia nova	17.75	12.70	80.00
Juniperus osteosperma	3.75	6.68	30.00
Pinus edulis	2.25	5.58	15.00
FORBS			
GRASSES			
Elymus elymoides	2.00	4.00	20.00
Elymus trachycaulus	1.75	4.26	15.00

Table 3-17: Coal Hollow Project. Total Cover and Composition (2007)		
Pinyon-Juniper (P-J) **Reference Area**		
A. TOTAL COVER	Mean Percent	Standard Deviation
OVERSTORY (o)	11.50	16.05
UNDERSTORY (u)	27.50	11.35
Litter	19.00	14.20
Bareground	46.50	19.69
Rock	7.00	2.45
TOTAL LIVING (o + u)	39.00	11.36
B. % COMPOSITION (u)		
Trees & Shrubs	89.56	14.77
Forbs	0.00	0.00
Grasses	10.44	14.77

Table 3-18: Coal Hollow Project. Woody Species Density (2007).

Pinyon-Juniper (P-J) **Reference Area** **SPECIES**	**Individuals Per Acre**
Artemisia tridentata	158.05
Artemisia nova	3213.71
Juniperus osteosperma	632.20
Pinus edulis	210.73
TOTAL	4214.70

Table 3-19: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Pasture Land (P) Proposed Disturbed	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
Artemisia tridentata	3.67	9.74	20.00
Artemisia nova	5.67	9.37	33.33
Chrysothamnus nauseosus	3.17	6.77	20.00
Rosa woodsii	0.50	1.50	10.00
FORBS			
Achillea millefolium	1.00	3.27	10.00
Aster sp.	0.83	2.61	10.00
Iris missouriensis	0.83	3.67	6.67
Iva axillaris	4.50	8.69	26.67
GRASSES (and grass-likes)			
Agropyron cristatum	3.83	6.28	30.00
Bromus inermis	1.50	7.21	6.67
Bromus tectorum	2.83	6.67	16.67
Elymus hispidus	6.50	12.12	30.00
Elymus smithii	3.00	8.23	20.00
Elymus trachycaulus	0.33	1.80	3.33
Juncus arcticus	0.50	1.98	6.67
Poa pratensis	5.83	13.85	16.67

Table 3-20: Coal Hollow Project. Total Cover and Composition (2007)		
Pasture Land (P) **Proposed Disturbed**		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover (u)	44.50	10.59
Litter	24.10	11.67
Bareground	29.63	10.53
Rock	1.77	1.48
B. % COMPOSITION (u)		
Shrubs	30.19	26.65
Forbs	17.64	22.73
Grasses	52.16	25.41

Table 3-21: Coal Hollow Project. Woody Species Density (2007).

Pasture Land (P) **Proposed Disturbed**	
SPECIES	**Individuals Per Acre**
Artemisia tridentata	618.30
Artemisia nova	348.50
Chrysothamnus nauseosus	303.53
Gutierrezia sarothrae	22.48
Rosa woodsii	56.21
TOTAL	1349.02

Table 3-22: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Oak Brush (OB) Proposed Disturbed	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
SHRUBS			
Juniperus scopulorum	1.75	7.63	5.00
Quercus gambelii	41.25	24.33	85.00
UNDERSTORY			
SHRUBS			
Artemisia tridentata	11.10	15.91	45.00
Juniperus osteosperma	0.50	2.18	5.00
Juniperus scopulorum	2.75	7.33	15.00
Quercus gambelii	3.40	4.91	35.00
Symphoricarpos oreophilus	5.50	9.99	35.00
FORBS			
GRASSES			
Bromus carinatus	0.25	1.09	5.00
Poa pratensis	0.25	1.09	5.00

Table 3-23: Coal Hollow Project. Total Cover and Composition (2007)		
Oak Brush (OB) **Proposed Disturbed**		
A. TOTAL COVER	Mean Percent	Standard Deviation
OVERSTORY (o)	43.00	22.49
UNDERSTORY (u)	23.75	12.23
Litter	61.25	15.24
Bareground	13.25	9.51
Rock	1.75	1.41
TOTAL LIVING (o + u)	66.75	14.86
B. % COMPOSITION (u)		
Trees & Shrubs	97.75	6.80
Forbs	0.00	0.00
Grasses	2.25	6.80

Table 3-24: Coal Hollow Project. Woody Species Density (2007).

Oak Brush (OB)
Proposed Disturbed

SPECIES	Individuals Per Acre
Artemisia tridentata	888.89
Symphoricarpos oreophilus	1169.59
Gutierrezia sarothrae	46.78
Juniperus osteosperma	233.92
Juniperus scopulorum	374.27
Quercus gambelii	1029.24
TOTAL	3742.70

Table 3-25: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Oak Brush (OB) Reference Area	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
SHRUBS			
Juniperus osteosperma	3.75	11.28	10.00
Juniperus scopulorum	1.75	7.63	5.00
Quercus gambelii	47.75	23.21	85.00
UNDERSTORY			
SHRUBS			
Artemisia tridentata	2.40	6.32	15.00
Juniperus osteosperma	3.00	9.14	10.00
Juniperus scopulorum	1.75	7.63	5.00
Pinus edulis	0.50	2.18	5.00
Quercus gambelii	5.85	8.56	40.00
Symphoricarpos oreophilus	1.75	3.96	20.00
FORBS			
GRASSES			
Poa pratensis	0.75	2.38	10.00
Poa secunda	4.00	7.00	30.00

Table 3-26: Coal Hollow Project. Total Cover and Composition (2007)		
Oak Brush (OB) Reference Area		
A. TOTAL COVER	Mean Percent	Standard Deviation
OVERSTORY (o)	53.25	13.63
UNDERSTORY (u)	20.00	8.37
Litter	66.70	21.24
Bareground	8.30	13.49
Rock	5.00	16.07
TOTAL LIVING (o + u)	73.25	12.68
B. % COMPOSITION (u)		
Trees & Shrubs	66.92	43.92
Forbs	0.00	0.00
Grasses	33.08	43.92

Table 3-27: Coal Hollow Project. Woody Species Density (2007).

Oak Brush (OB) Reference Area	
SPECIES	**Individuals Per Acre**
Artemisia tridentata	209.16
Juniperus osteosperma	26.14
Juniperus scopulorum	130.72
Pinus edulis	52.29
Quercus gambelii	1333.37
Symphoricarpos oreophilus	339.88
TOTAL	2091.57

Table 3-28: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Meadow (M) Proposed Disturbed	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
Artemisia nova	1.50	6.54	5.00
Rosa woodsii	11.75	12.07	60.00
FORBS			
Achillea millefolium	3.50	6.73	40.00
Equisetum arvensis	0.75	2.38	10.00
Iris missouriensis	24.00	13.19	95.00
GRASSES (and grass-likes)			
Carex microptera	7.75	10.43	30.00
Elymus lanceolatus	1.25	3.11	15.00
Elymus smithii	0.25	1.09	5.00
Elymus trachycaulus	0.50	2.18	5.00
Juncus arcticus	24.00	9.95	100.00
Koeleria nitida	1.50	4.77	10.00
Phleum pratensis	0.50	2.18	5.00
Poa pratensis	7.50	7.66	60.00
Poa secunda	1.25	3.11	15.00

Table 3-29: Coal Hollow Project. Total Cover and Composition (2007)		
Meadow (M) **Proposed Disturbed**		
A. TOTAL COVER	Mean Percent	Standard Deviation
Understory Cover (u)	86.00	7.18
Litter	8.25	4.69
Bareground	4.05	1.96
Rock	1.70	3.05
B. % COMPOSITION (u)		
Shrubs	15.88	15.08
Forbs	32.54	16.94
Grasses	51.58	13.82

Table 3-30: Coal Hollow Project. Woody Species Density (2007).

Meadow **Proposed Disturbed**	
SPECIES	**Individuals Per Acre**
Rosa woodsii	384.06
TOTAL	384.06

Table 3-31: Coal Hollow Project. Living Cover and Frequency by Plant Species (2007).

Meadow (M) Reference Area	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
Rosa woodsii	9.75	9.68	65.00
FORBS			
Achillea millefolium	0.25	1.09	5.00
Iris missouriensis	32.37	12.50	100.00
GRASSES (and grass-likes)			
Elymus lanceolatus	0.50	1.50	10.00
Juncus arcticus	33.00	13.55	100.00
Poa pratensis	11.00	14.20	60.00
Poa secunda	1.25	3.83	10.00

Table 3-32: Coal Hollow Project. Total Cover and Composition (2007)

Meadow (M) Reference Area		
A. TOTAL COVER	Mean Percent	Standard Deviation
Total Living Cover (u)	88.50	5.94
Litter	7.85	4.98
Bareground	2.65	2.03
Rock	1.00	0.00
B. % COMPOSITION (u)		
Shrubs	11.04	11.01
Forbs	37.38	13.75
Grasses	51.57	13.78

Table 3-33: Coal Hollow Project. Woody Species Density (2007).

Meadow (M) Reference Area SPECIES	Individuals Per Acre
Rosa woodsii	2225.69
TOTAL	2225.69

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 3-34.

Table 3-34: Biomass Production of Plant Communities in the Coal Hollow Permit Area

(1) *Estimates* (from soil and approx. vegetation types) - Source: U.S. Department of Agriculture SCS (NRCS). July 1990. Soil Survey of Panguitch area, Utah: Parts of Garfield, Iron, Kane, and Piute Counties.

(2) *Actual measurements.* - Source: Cedar Creek Associates (1986) *in* Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project, Alton, Utah.

(*) *Estimates* - Source: Fieldwork during 2007 by Mt. Nebo Scientific, Inc.

MAP SYMBOL (see *Vegetation Map*, Drawing 3-1)	PLANT COMMUNITY	Pounds/Acre (1)	Pounds/Acre (2)
SB	Sagebrush/Grass	750	762
P	Pasture Land (*)	1100	1100
M	Meadow	2000	2121
P-J	Pinyon-Juniper	50	33
OB	Oak Brush [*called Mountain Brush* (2)]	1500	1471
RB/SB	Rabbitbrush/Sagebrush (*)	700	700

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 specific areas proposed disturbed and reference areas for mining year one of 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 Coal Hollow 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.

- In September 2007, sensitive plant species surveys were conducted during quantitative sampling of additional proposed disturbed and reference areas for mining years one through three of the project.

- In September 2007, additional quantitative sampling was conducted in meadow areas outside the permit area to be used as a companion study with other 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 3-35 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 3-35: 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: 3-1.* 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

Several vegetation maps have been prepared for the Coal Hollow Project. A revised vegetation map has been prepared that includes all vegetation sample areas, plus other updated map information [Vegetation Map, Drawing 3-1, (12/26/07)]. The new map replaces the previous vegetation maps. This new map 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 disturbance 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 the land are mined (see Chapter 5).

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, have been delineated on the aforementioned new vegetation map.

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 have been represented on the new maps.

323.400. Plant Communities Map

An initial vegetation map was prepared that delineated the plant communities that existed within the Coal Hollow Project permit area. This **first** map was prepared by delineating the plant communities from an existing vegetation map to a permit quadrangle map (see Section 321.100 for more details). However, a new flight was conducted in 2006 that provided aerial photography with more detailed information to be used to update many maps of the project area. Consequently, a **second** vegetation map was prepared using the new aerial photography (along with ground-truthing), and submitted along with the first map to DOGM (MRP submittal dated May 25, 2007). Finally, a **third** vegetation map was prepared to reflect information and to show new sample areas within the plant communities of the permit and adjacent areas [see *Vegetation Map, Drawing 3-1, (12/26/07)*]. This map **replaced** the first and second maps and was submitted to DOGM (MRP submittal dated January 15, 2008.

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% increase 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 3-36 shows the plant communities that may eventually be disturbed by mining operations at the Coal Hollow Project area.

Table 3-36: Vegetation Communities of the Coal Hollow Permit Area Proposed for Disturbance	
MAP SYMBOL (see *Vegetation Map, Drawing 3-1*)	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 3-37 *through* 3-42. These rates have been based on drill seeding methods described in this document. When broadcast seeding is employed these rates will be doubled.

Table 3-37: 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. The number reflects the pounds of pure live seed (PLS) per acre.

*** 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 3-38: 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. The number reflects the pounds of pure live seed (PLS) per acre.

** 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 3-39: 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. The number reflects the pounds of pure live seed (PLS) per acre.

Table 3-40: 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. The number reflects the pounds of pure live seed (PLS) per acre.

** 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 3-41: 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. The number reflects the pounds of pure live seed (PLS) per acre.

Table 3-42: Revegetation Seed Mixture for the Rabbitbrush/Sagebrush Community (*disturbed 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. The number reflects the pounds of pure live seed (PLS) per acre.

*** 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 3-37 *through* 3-42.

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 3-37.

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 3-37 *through* 3-42).

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 3-37 *through* 3-42).

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 3-37 *through* 3-42). 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 Table 3-37 *through* 3-42).

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. (c) 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*). 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 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.