PacifiCorp owns and leases certain fee coal lands, together with assigned federal coal leases, and controls approximately 22,500 acres of contiguous minable property located in Emery County, Utah. Geography, the area is known as East Mountain, a large, relatively flat plateau, containing three minable coal seams.

Coal was mined through three separate mines: Deer Creek Mine (currently under reclamation – 2018), Cottonwood/Wilberg Mine (final reclamation completed 3/2018), and the Des Bee Dove Mine (final reclamation completed 6/2003 and Phase III Bond Release was accepted 8/2014). Several federal coal leases are coincidental to both the Cottonwood/Wilberg and Deer Creek mines as the mines are superimposed. The description of the permit area for both mines is listed in their respective permits. Both mines are owned and operated by PacifiCorp.

Three coal seams existed in the Cottonwood/Wilberg mine area; Blind Canyon seam (upper), Cottonwood seam (middle), and Hiawatha seam (lower). The Deer Creek Mine was producing coal from the Blind Canyon Seam and in the North Hiawatha seam. The Cottonwood seam contained excessive in-seam temperature gradients and was determined as unmineable. The majority of coal produced from Cottonwood Mine was from the Hiawatha seam. The coal haulage system (beltline) of the Cottonwood/Wilberg Mine is located in this seam.

The permit boundary and approximate locations of faults that have affected the Cottonwood/Wilberg Mine plan are illustrated in Figure 1. Faults that have influenced mining are the Pleasant Valley Fault, Deer Creek Fault, and the Roan’s Canyon Fault.

In the Cottonwood/Wilberg Mine, the Hiawatha seam is bounded on the north by the thinning of the seam below five feet in thickness. On the east, the seam is bounded by the Deer Creek Fault and the Pleasant Valley Fault. On the south and west, the seam is bounded by the coal outcrop and lease border, respectively.
Cottonwood/Wilberg Mines

The Blind Canyon seam within the Cottonwood/Wilberg Mine lies approximately 100 feet above the Hiawatha seam. This seam is bounded on the north by the Deer Creek Mine workings. The east, south and west is bounded by the thinning seam of less than five feet in thickness.

Since part of the Cottonwood/Wilberg Mine was overlain by areas of the Deer Creek Mine, the upper seam was mined prior to mining the lower seam. In addition, mining plans were designed with a system of barriers to protect a 345KV power line.

Wilberg Mine

The Wilberg Mine was acquired by Peabody Coal Company in 1958. In March 1977, Utah Power and Light (UP&L) acquired the mine from Peabody Coal and was officially listed as the lessee on September 1, 1977. In 1982, UP&L successively bid the South Lease (U-47978) federal coal tract.

On July 1, 1985, the Wilberg Mine and the South Lease area were separated into two distinct mines; the Wilberg Mine (MSHA ID No. 42-00080) and Cottonwood Mine (MSHA ID No. 42-01944). Each mine operated independently of the other utilizing separate equipment and ventilation systems. The Wilberg portals were located on the north coal outcrop in Grimes Wash on the southern end of East Mountain. Mine personnel and coal transfer facilities were located at the Wilberg portal.

The Cottonwood portals were located on the south coal outcrop of the Grimes Wash. These portals provided for men and equipment access, underground conveyor belt coal haulage system, and mine ventilation. Although they were separate underground operations, the two mines shared common surface facilities, thus forming the Cottonwood/Wilberg complex.

On May 6, 1996, the Cottonwood/Wilberg Mine and its attached facilities were reassigned an MSHA identification number. The new identification number that was given to the mine was the Trail Mountain identification number (MSHA ID No. 42-01211). This number was assigned to
the Cottonwood/Wilberg mine since all Trail Mountain coal was transported through this mine. In 2015, the Trail Mountain Mine was sold and transferred under a new ownership. In 2016, the MSHA ID for the Cottonwood/Wilberg Mine was abandoned.

Cottonwood/Wilberg Mine
PacifiCorp completed final reclamation of the Cottonwood/Wilberg Mine in March of 2018. Its surface facilities occupied approximately twenty acres of disturbed land at the confluence of the Left and Right forks of the Grimes Wash. The surface facilities included coal handling, electrical substation, equipment maintenance, material storage, parking areas and drainage and sediment control structures. Office, bathhouse and warehouse facilities are located underground. These facilities were demolished and the land surface regraded and revegetated.

Cottonwood/Wilberg, Des Bee Dove, and Trail Mountain Waste Rock Sites
Bureau of Land Management Right-of-Way UTU-37642: Located 1.5 miles south of the Cottonwood/Wilberg Mine, the original 48.62 acre site was designed as an open storage and truck loadout for the mine. The Right of Way (ROW) grant, UTU-37642 (east side of State Highway 57), was issued by the Bureau of Land Management (BLM) in 1977, but the development of a concrete storage silo for coal on site changed the need for the loadout. A modification was submitted to use this land for underground development waste storage in connection with underground development ongoing in the Cottonwood/Wilberg Mine. The ROW was modified to accommodate coal bed methane degasification conducted by Texaco Inc.

The modification included:
1) 1997 relinquishment of 1.08 acres (access to Texaco well 35-14).
2) 1999 relinquishment of 12.98 acres (Texaco well 34-80).

Total relinquishment of this ROW was 14.06 acres. Of the original 48.62 acre site, only 34.56 acres remained with 1.81 acres of it disturbed. Historically, the Cottonwood/Wilberg Waste Rock Site was located in the southern portion of this ROW. Phase III Bond Release was granted in July 22, 2009. In October 2015, 32.7 acres were accepted by the
BLM for relinquishment with 1.86 acres to remain for rock and soil storage. This 1.86 acres area was also reclaimed in March of 2018. (Note: The BLM relinquishment notice states 1.86 acres remain however, PacifiCorp's disturbed calculations show 1.81 acres. This acreage is what is reported as disturbed for the rock and soil storage area)

Bureau of Land Management Right-of-Way UTU-65027: Located 1.7 miles south of the Cottonwood/Wilberg Mine is BLM ROW UTU-65027 (west side of State Highway 57). This 25.85 acre site was used for underground waste storage in connection with underground development ongoing in the Trail Mountain Mine. This site replaced ROW UTU-37642 as the primary waste rock storage facility as the old ROW reached design capacity. In 2015, the Trail Mountain Mine was sold and transferred under a new ownership. The sale included site.

This application and related information are intended to address the Cottonwood/Wilberg Mine complex and its affect on the surrounding area. However, several of the environmental resource studies such as vegetation, soils, and wildlife, apply to the applicant's total contiguous area and can be better evaluated as a whole as they refer not only to the specific mine but to the adjacent areas.
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_INCORPORATED_

FEB 20 2019

Div. of Oil, Gas & Mining
SOILS INFORMATION

Construction of the Wilberg Mine was begun and completed during the year 1978. Approvals for the facilities were granted in early 1978 by the U.S. Geological Survey under 30 CFR 211 which required approximately the same soil conservation practices as SMACRA's interim regulations effective December 13, 1977.

Soil classifications (horizons) as delineated in the interim regulations were non-existent or so shallow as to preclude attempts of salvage and storage.

To meet initial or interim revegetation requirements and provide soil mapping for permanent regulatory permit application, a consultant was engaged to classify and test the existing soil (after construction for acceptance as a plant growth medium.

Company's consultant is Dr. A.R. Southard, soil scientist, Utah State University, who under contract, performed the field work and prepared the following report and soil maps. (Information was updated in 1989 by Dr. Southard). Southard reported three major conclusions:

1. Basically, no topsoil (Horizon A) exists in sufficient quantities to warrant stockpiling (based on undisturbed adjacent areas).

2. Existing materials, selectively, are acceptable as a plant growth medium.

3. Final reclamation would be enhanced, especially sedimentation control, by induced grass species.

Further, no soil mapping of the disturbed area is possible (Southard).

The Cottonwood facilities were constructed in 1985.

Overview

Portal and support facility areas for the Cottonwood/Wilberg Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity is there a source of material which would usually be referred to as 'topsoil'.
Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal areas should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized Part 4, Appendix D.

Additional soil sampling was done in 1989. The results are presented in Part 4, appendix D.

SOILS REPORT OF THE WILBERG MINE
(See Maps 2-17 and 2-18)

C - Cut Areas
These are areas disturbed in order to effectively gain sufficient work area to carry out mining operations. Sandstone and shale bedrock are exposed. In general, these areas have chemical and physical properties which will support plant growth. The major problems are steepness and aridity.

F - Fill Areas
These areas are nearly level (parking areas) and steep slopes (more than 25%). The material derived from sandstone and shale with some coal waste is capable of supporting plant growth. The parking lots and storage areas may have places where undesirable conditions for plant growth have developed; these areas must be covered with suitable growth media before revegetation can be successful.

R - Or - Rubble Land - Rock Outcrop, 60-80% Slopes
Rubble land is covered by boulders and stores. The vegetation is limited to areas between stones and boulders and lichens.

Rock outcrop is exposed bedrock, mostly sandstone and shale. In general, the material derived from
Cottonwood/Wilberg Mines

sandstone is suitable for growth media, especially juniper and grasses. Material derived from shale is, in general, less suitable for plant growth; and efforts should be made to cover the shale with sandstone material to enhance reestablishment of native vegetation.

OR-R-U - Rock Outcrop - Rubble Land - Lithic Ustorthents.

40-70% Slopes
Rock Outcrop is dominantly from sandstone and shale. The boulders in the Rubble Land are from sandstone (75%). Ustorthent soils are shallow and formed in material derived from sandstone. Permeability is moderately rapid in the soil material above the rock (25%).

Taxonomic classification\(^1\) is loamy-skeletal mixed mesic Lithic Ustorthents. Pedon description follows:

\[ A \]
0-4 inches; pale brown (10YR 6/3) very gravelly loam; olive brown (2.5Y 5/4) when moist; weak, fine granular structure; friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; common fine and few medium pores; 55% gravel; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); abrupt wavy boundary.

\[ C \]
4-14 inches; light gray (2.5Y 7/2) extremely flaggy, fine sandy loam, light yellowish brown (2.5Y 6/4) when moist; massive; very friable; few fine, medium, and coarse roots; 40% flagstones; 30% channers; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8) ; abrupt smooth boundary.

\[ R \]
14 inches; sandstone.

\(^1\) Reclassified by Dr. A.R. Southard in May, 1989.
Included in mapping are areas of material which have sloughed and been deposited by gravity in small areas (less than 100 sq. ft.). The soil material is deeper than Ustorthent soils, and is characterized in Part 4, Appendix D, General Soil Map of the Permit Area, Table I, samples 1112-1116. These areas are of such limited extent that they are of no consequence as a local source of cover material for revegetation.

REFERENCES


Soil Survey Staff, 1975. Soil Taxonomy – a basic system of soil classification for making and interpreting soil surveys. USDA Handbook 436. GPO.

Soil Survey Staff, 1954. Diagnosis and improvement of saline and alkali soils. USDA Handbook 60. GPO.


GENERAL SOIL MAP OF THE PERMIT AREA

**I-E-R** Typic Ustochrepts-Lithic Ustorthents-Rock Outcrop loamy-skeletal, shallow association, 40-60% slopes.

These soils are mostly loamy-skeletal and lithic with areas of sandstone outcrops. In this map unit, Typic Ustochrepts make up about 50%, lithic Ustorthents about 25%, and Rock Outcrop and Rubble 12nd about 20%; included are small areas of Mollisols on north and east-facing slopes.

The Ustochrepts can be generally described as follows: pale brown gravelly loam or sandy loam surface layer, with 25% sandstone fragments, 35 cm thick, underlain by a pale brown gravelly or stony loam, with 35-50% sandstone fragments, 100 cm thick.

The Ustorthents are mostly shallow, underlain by rock within 50 cm of the surface.

Rubble Lands are those areas where the soils are covered by large boulders so close together that there is little area between the boulders for plants to grow.

Rock Outcrop is exposed areas of bedrock. These areas are often nearly vertical cliff walls in canyons.

**Mp** Pachic Cryoborolls, loamy and loamy skeletal, 10-25% slopes.

These are dark-colored soils in which the surface soil is more than 50 cm thick.

Included in mapping are Typic Cryoborolls, Moffic Cryoboralfs and Typic Cryochrepts. Pachic Cryoborolls can be generally described as follows: a very dark grayish-brown loamy surface layer 60 cm thick, overlying a grayish-brown loamy subsoil 30 cm thick, and, underlain by a pale brown gravelly sandy loam substratum containing 50% sandstone fragments.
Mt | Typic Cryoborolls, loamy and loamy-skeletal, 25-40% slopes.

C

These are dark-colored soils under mixed conifer, sagebrush, and grass. Included are areas of Pachic Cryoborolls and Mollic Cryoboralfs. Cryochrepts are on windswept ridges. The Typic Cryoborolls can be generally described as follows: a dark grayish brown loamy surface layer about 40 cm thick, underlain by a pale brown clayey subsoil 40 cm thick, over a light gray calcareous substratum with up to 50% sandstone fragments.

References
1. Soils maps of Utah Power and Light mine sites: Deer Creek, Deseret, and Wilberg.
2. General soils map of Utah.
3. Soils map of a test area in T14S, R5E through 9E.
4. Soils map of Northwest Carbon, Inc., Rilda Canyon and Trail Creek Mine sites.

VEGETATION MONITORING PLAN - COTTONWOOD/WILBERG MINE

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of underground mining activities at the Cottonwood/Wilberg mines on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the following report titled “Vegetation Information for the Wilberg Mine”. This report follows this section.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.
Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continue on a five year schedule.

Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Uinta-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.
Vegetation Information for the Wilberg Mine

Report Prepared for
Utah Power & Light Company

by
Jerry R. Barker, Ph.D.
Range Ecologist
Bio-Resources, Inc.
Logan, Utah

July 1982
Vegetation Information for the Wilberg Mine

This reports the vegetational information for the Wilberg Mining area. The Wilberg Mine was existing at the time of the vegetational sampling. However, no new disturbances are planned within the permit area.

Methodology

Six vegetational types were identified within the permit area and adjacent areas and mapped (scale 1:24,000). Aerial photography (scale 1:24,000) and field reconnaissance were utilized to construct the vegetation map. Aerial photography (taken in 1962) and the vegetation of adjacent canyons and areas were used to infer what species composition and aerial plant cover were before the present disturbance occurred at the Wilberg Mine (see Map 2-15).

A reference site to represent the vegetation type disturbed by mining was located as close to the disturbed area as feasible. Differences in species composition, aerial plant cover, slope, aspect, soil and geology were minimized between the disturbed area and reference site. The reference site was marked in the field with metal T-posts and located on the vegetational map (Map 2-16).

Pinyon-juniper is the only vegetation type disturbed by mining activities.

Vegetational analyses of the reference site consisted of developing a list of species by the life form, measuring aerial plant cover, determining shrub density and composition. Also, tree density by size class was determined.

Aerial cover was measured by the step-point method. Plant species, litter, rock or bare ground was determined every third pace along a 20 point transect. The starting point and direction of each transect was randomly selected.

The point-center quarter method was used to measure shrub density. At each sampling point two perpendicular lines were inscribed to delineate four quarters centered over the sampling point. The distance from the nearest shrub in each quarter to the sampling point was measured and then the shrub was identified. Shrub density was determined by the following equations:
\[ A_j = \left( Y_1 + Y_2 + Y_3 + Y_4/4 \right)^2 \]
\[ D = U/\sum A_j/n \]

where:

\[ Y_i = \text{distance from point to nearest shrub} \]

in the ith quarter,

\[ A_j = \text{mean area per sampling point}, \]

\[ N = \text{sample size}, \]

\[ D = \text{density, the number of shrubs per unit area}, \]

\[ U = \text{unit area}, \]

Five sampling points were placed 15 paces apart along a transect. The starting point and direction of each transect was randomly located.

Tree density was obtained by a complete enumeration by species within the reference site. Tree size class was determined by measuring diameter at breast height (DBH) for all tree species except pinyon pine and Utah juniper which were measured at the base.

Statistical adequacy for sample size for aerial plant cover and shrub density was determined by the following formula:

\[ N_{\text{min}} = \frac{t^2s^2}{(d\bar{x})^2} \]

where:

\[ N_{\text{min}} = \text{minimum sample size}, \]

\[ t = \text{t-value for a 2-tailed test}, \]

\[ s = \text{standard deviation}, \]

\[ d = \text{allowable change in sample mean}, \]

\[ \bar{x} = \text{sample mean}. \]
Sample size for aerial cover was tested at the 90 percent confidence level \( t_{0.90} = 1.645 \) with a 10 percent error of the mean \( (d=0.10) \). Shrub density sample size was tested at the 80 percent confidence level \( t_{0.80} = 1.282 \) with 10 percent error of the mean \( (d=0.10) \). Adequacy for aerial cover and shrub density was calculated after 10 and 20 samples, respectively. Sample size for density was determined using mean area per plant. Table 1 gives the minimum sample size and observed sample size for the reference area. Data presented hereafter will be based on the observed sample number.

Shrub composition based on density was determined by the following formula:

\[
C = \frac{S_i}{T}
\]

\[
T = \Sigma S_i
\]

where:

\( S_i \) = total individuals of the \( i \)th species,

\( T \) = total number of shrubs sampled,

\( C \) = shrub composition.

Jaccard's Community Coefficient was used to quantify the similarity in plant species between the reference and disturbed area. The equation is:

\[
I.S. = \frac{(C/A + B - C)}{A + B - C} \times 100\%
\]

where:

\( I.S. \) = similarity index,

\( A \) = total species in community A,

\( B \) = total species in community B,

\( C \) = number of species common to both.

The Shannon Index was used to calculate species diversity in the reference areas. The index is:

\[
H' = \sum_{i=1}^{P} P_i \ln P_i
\]

where:

\( H' \) = species diversity index,

\( P_i \) = proportion of the observations found in category \( i \).
Diversity calculations based on ground cover by species. The maximum possible diversity for a reference area is:

\[ H'_{\text{max}} = \ln K \]

where:

- \( H'_{\text{max}} \) = maximum diversity,
- \( K \) = the number of categories, i.e., species.

The ratio between \( H' \) and \( H'_{\text{max}} \) is referred to as species evenness. This is calculated as:

\[ J = \frac{H'}{H'_{\text{max}}} \]

where:

- \( J \) = species evenness.

Data for aerial cover, species list by life form, and tree density were collected August 12-15, 1980, and analyzed September 8 and 9, 1980. Shrub density was measured April 16, 1982 with data analyzed April 21, 1982.

United States Forest Service and Utah Division of Wildlife Resources personnel located in Price, Utah were consulted on August 15 and 16, 1980 with regards to livestock and big game vegetational use within the permit area.

Personnel involved with vegetation sampling, data analysis, and report writing:

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Personnel consulted in preparation of the information:

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  Utah State University
  Logan, Utah 84321

Revised 11/21/83
Permit Area Vegetation

The mine property permit area is 18,000 acres (Table 2). Six major vegetation types were identified within the permit area and adjacent land (see 2-15, Vegetation Map). Mixed conifer, pinyon-juniper, sagebrush, grass, riparian and salt desert shrub are the six vegetation types (Table 2). The mixed conifer type occurs primarily at the higher elevations (above 9,000 ft.) or at lower elevations with a northern exposure. The pinyon-juniper vegetation type is found on the steep, rocky slopes with a southern exposure and the relatively flat ground at lower elevations (7,000 ft.). At the higher elevations and on north-facing slopes, it is common for the pinyon-juniper community to intermix with the mixed conifer community. Elevation for the pinyon-juniper vegetation type varies from 7,000 to 9,000 feet. The sagebrush and grass vegetation types also occur at the high elevations, but are restricted to the drier sites than the mixed conifer. The riparian vegetation type is located along Deer Creek, Cottonwood and Grimes Wash. This vegetation type is better developed along Deer Creek below the mine, then along Cottonwood and Grimes Wash. The salt desert shrub vegetation type is not found within the permit area, but is located on adjacent land. It has a southwestern exposure and elevation varies from 6,600 to 7,600 feet.
Area Disturbed by Mining

The disturbed area of the Wilberg Mine is about 19.5 acres (Table 3). Elevation varies from 7,400 to 8,000 feet. The general slope varies from 33-36°. Annual precipitation averages about 8 inches. The topography is dominated by a southern exposure. The vegetation type disturbed by mining activities was a pinyon-juniper intermixing with the mixed conifer (Table 4). Pinyon pine and Utah juniper were the dominant trees. However, white fir and Douglas fir were also present. Saskatoon serviceberry, low rabbitbrush and Cutler ephedra, cuneate saltbush and shadscale were important shrubs. Herbaceous plants included saline wildrye, bluebunch wheatgrass, Indian ricegrass, Unita groundsel and corymbed eriogonum. Total aerial plant cover varied around 30-35 percent. Soils were probably Ustorthents*.

Reference Site

A reference site was established to represent the pinyon-juniper type disturbed by mining activities (Table 5).

The reference site 4800 m² has a northeastern exposure with an elevation of 7,500 ft. Slope varies around 35°. Common plants include Utah Juniper, pinyon pine, Douglas fir, Saskatoon serviceberry, Cutler ephedra, low rabbitbrush, bluebunch wheatgrass, Indian ricegrass and saline wildrye (Table 6). Total plant cover is 38 percent with trees providing the majority of ground cover (Table 7). Shrub and tree densities are 1,461 and 78 plants per acre, respectively (Tables 8 and 9). Saskatoon serviceberry is the most common shrub while cutler ephedra and big sagebrush are the least common. Pinyon pine is the most common tree while limber pine is the least common. Eighty nine percent of the trees occur in the smallest DBH size class. The species diversity index is 2.77. The soils are loamy-skeletal mixed mesic Lithic Ustorthents*.

Wildlife and Livestock

The mining permit area is located with the Ferron Ranger District of the Manti-LaSal National Forest managed by the United States Forest Service. Both wildlife and livestock utilize the permit area for grazing. However, livestock grazing is limited to the higher elevations.

Deer, elk and moose utilize the area for grazing (Table 10). Deer have a greater impact on the vegetation than elk or moose because of their high numbers.

(*Reclassified by Dr. A.R. Southard in May, 1989)
Besides wildlife use, the area provides summer grazing for cattle (Table 1). Cattle grazing occurs on the East Mountain allotment of the Ferron Ranger District. For the past several years, there has been a 10 percent non-use of the available AUM's. During 1980 all AUM's were utilized. Overall range condition is fair.

**Endangered or Threatened Plants**

During the vegetation sampling, no endangered or threatened plant species were identified.

**Sensitive Plants**

In 1986, a sensitive plant Hedysarum occidentale var. canone was identified by the Forest Service within the permit area at two different locations. The first location is on the slope north of the parking area in Grimes Wash. The second was in Miller Canyon approximately 1/4 mile east of the Cottonwood Canyon road along the creek.

Location and mapping of the identified populations was initiated in 1987 and 1988. Also in 1988 the BLM identified Hedysarum distribution on BLM land within the Cottonwood/Wilberg permit area. This information is reflected on Map 2-15A. Mapping of Hedysarum distribution in the permit area will continue through 1989. The majority of identified populations are in locations which will not be impacted by mining operations. However, a monitoring program was formulated in cooperation with the agencies, to assess the population trends.

Two plots (1/100 acre) were located in populations on USFS land within the permit area in 1987. One plot is located in the Right Fork of Grimes Wash and one plot is located in Miller Canyon. The plots were read by Bob Thompson, US Forest Service, Price, in 1987 and 1989. Measurements of growth and age classification (young vs. mature plants) were made on all plants in each 1/100 acre plot. This information will provide the basis for assessing the trend of the monitored population. Monitoring of the two plots will continue on at least three (3) year intervals until the trends are identified.

Additionally, monitoring of the small population in Newberry Canyon, that was impacted by cliff spalling, was begun in 1988. The perimeter of the impacted population (31'x25'x31'x34') was marked with stakes. All plants found within the area were identified as impacted or not impacted. Fourteen (14) plants were impacted by spalled rubble and eighteen (18) plants were not impacted. Also, a separate unaffected population was located near the impacted area. This population was also inventoried in 1988 with twenty-seven (27) plants observed. This monitoring will continue as part of the Cottonwood Mine Escarpment study. The monitoring will also be discussed in the Annual Vegetation Monitoring reports.
Subsequent monitoring of the Newberry Canyon populations will include an inventory of total plants in both populations, growth measurements (height and diameter), and age classification.
Table 1. Sample adequacy for aerial plant cover and density for the pinyon-juniper reference area at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Reference Site</th>
<th>Parameter</th>
<th>N_{min}</th>
<th>\bar{x}</th>
<th>S.D.</th>
<th>N_{obs}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper</td>
<td>Aerial cover</td>
<td>16</td>
<td>40.0</td>
<td>9.72</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Shrub density</td>
<td>28</td>
<td>2.9</td>
<td>1.24</td>
<td>35</td>
</tr>
</tbody>
</table>

1 Determined after 10 and 20 samples for total cover and shrub density, respectively.
2 Sample mean of mean area per plant (m²)

Table 2. Vegetation types and size of each that are found within the permit area and adjacent land.

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Total Acres</th>
<th>% of Permit Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>9,037.1</td>
<td>50.2</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>4,524.4</td>
<td>25.1</td>
</tr>
<tr>
<td>Sagebrush</td>
<td>4,053.0</td>
<td>22.5</td>
</tr>
<tr>
<td>Grass</td>
<td>302.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Riparian</td>
<td>84.0</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>18,000</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Salt Desert Shrub</td>
<td>281.7</td>
<td>0</td>
</tr>
</tbody>
</table>

1 The salt desert shrub type is located on adjacent land to the permit area. It is influenced by the Des-Bee-Dove Pond (see vegetation map).

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Revised 11/23/83
Table 3: Vegetation type, number of acres, and percent of vegetation type disturbed by mining at the Cottonwood/Wilberg Mine.

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Acres Disturbed</th>
<th>% of Vegetation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-juniper</td>
<td>19.5</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Table 4: Plant species that were inferred to have existed within the disturbed portion of the pinyon-juniper vegetation type at the Cottonwood/Wilberg Mine.

Trees
- Abies concolor
- Juniperus osteosperma
- Pinus edulis
- Pseudotsuga menziesii
- White fir
- Utah juniper
- Pinyon pine
- Douglas fir

Shrubs
- Amelanchier alnifolia
- Artemisia tridentata
- Atriplex confertifolia
- Cercocarpus ledifolius
- Chrysothamnus nauseosus
- C. viscidiflorus
- Ephedra cutleri
- Xanthocephalum sarothrae
- Saskatoon serviceberry
- Big sagebrush
- Shadscale
- Curlleaf mountain mahogany
- Rubber rabbitbrush
- Low rabbitbrush
- Cutler ephedra
- Broome snakeweeds

Forbs
- Cryptantha sp.
- Eriogonum corymbosum
- Galium sp.
- Penstemon eatonii
- Senecio multiflorus
- Cryptantha
- Croymbed eriogonum
- Galium
- Penstemon
- Uinta groundsel

Grasses
- Agropyron spicatum
- Elymus salinus
- Oryzopsis hymenoides
- Bluebunch wheatgrass
- Salina wildrye
- Indian ricegrass

INTEGRATED

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Revised 11/21/83
### Table 5. Similarity between the pinyon-juniper reference site and its respective disturbed area at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reference</th>
<th>Disturbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover, %</td>
<td>37.5</td>
<td>30-35</td>
</tr>
<tr>
<td>Density, No./acre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrub</td>
<td>1,461</td>
<td>-</td>
</tr>
<tr>
<td>Tree</td>
<td>78</td>
<td>-</td>
</tr>
<tr>
<td>Species composition, s&lt;sup&gt;1&lt;/sup&gt;</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Aspect</td>
<td>Northeastern</td>
<td>Northeastern Southwestern</td>
</tr>
<tr>
<td>Elvation, ft.</td>
<td>7,500</td>
<td>7,400-8,000</td>
</tr>
<tr>
<td>Slope, °</td>
<td>33-37</td>
<td>33-36</td>
</tr>
<tr>
<td>Soil*</td>
<td>Ustorthent</td>
<td>Ustorthent</td>
</tr>
<tr>
<td>Geology</td>
<td>Colluvium</td>
<td>Colluvium</td>
</tr>
<tr>
<td>H'</td>
<td>2.77</td>
<td>-</td>
</tr>
<tr>
<td>H'&lt;sub&gt;max&lt;/sub&gt;</td>
<td>2.77</td>
<td>-</td>
</tr>
<tr>
<td>J</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>Index of Similarity, %</td>
<td></td>
<td>70.8</td>
</tr>
</tbody>
</table>

<sup>1</sup>s = total plant species  
*Revised by Dr. A.R. Southard in May, 1989*
Table 6. Common plant species occurring within the pinyon-juniper reference site at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abies concolor</td>
<td>White fir</td>
</tr>
<tr>
<td>Juniperus osteosperma</td>
<td>Utah juniper</td>
</tr>
<tr>
<td>Pinus edulis</td>
<td>Pinyon pine</td>
</tr>
<tr>
<td>P. flexilis</td>
<td>Limber pine</td>
</tr>
<tr>
<td>Pseudotsuga menziesii</td>
<td>Douglas fir</td>
</tr>
<tr>
<td>Amelanchier alnifolia</td>
<td>Saskatoon serviceberry</td>
</tr>
<tr>
<td>Artemisia tridentata</td>
<td>Big sagebrush</td>
</tr>
<tr>
<td>Atriplex confertifolia</td>
<td>Shadscale</td>
</tr>
<tr>
<td>A. cuneata</td>
<td>Cuneate saltbush</td>
</tr>
<tr>
<td>Chrysothamnus viscidiflorus</td>
<td>Low rabbitbrush</td>
</tr>
<tr>
<td>Ephedra calteri</td>
<td>Cutler ephedra</td>
</tr>
<tr>
<td>Leptodactylon caespitosa</td>
<td>Mat prickly phlox</td>
</tr>
<tr>
<td>Physocarpus sp.</td>
<td>Ninebark</td>
</tr>
<tr>
<td>Xanthocephalum sarothrae</td>
<td>Broome snakeweed</td>
</tr>
<tr>
<td>Eriogonum corymbosum</td>
<td>Corymbed eriogonum</td>
</tr>
<tr>
<td>Galium sp.</td>
<td>Galium</td>
</tr>
<tr>
<td>Hedysarum boreale</td>
<td>Northern sweetvetch</td>
</tr>
<tr>
<td>Penstemon eatonii</td>
<td>Penstemon</td>
</tr>
<tr>
<td>Senecio multilobatus</td>
<td>Uinta groundsel</td>
</tr>
<tr>
<td>Agropyron spicatum</td>
<td>Bluebunch wheatgrass</td>
</tr>
<tr>
<td>Elymus salinus</td>
<td>Salina wildrye</td>
</tr>
<tr>
<td>Oryzopsis hymenoides</td>
<td>Indian ricegrass</td>
</tr>
</tbody>
</table>
Table 7. Ground cover by species for the pinyon-juniper reference site at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trees</strong></td>
<td></td>
</tr>
<tr>
<td>Pinyon pine</td>
<td>9.8</td>
</tr>
<tr>
<td>White pine</td>
<td>2.1</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>2.0</td>
</tr>
<tr>
<td>Utah juniper</td>
<td>2.0</td>
</tr>
<tr>
<td>Limber pine</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Shrubs</strong></td>
<td>8.1</td>
</tr>
<tr>
<td>Saskatoon serviceberry</td>
<td>4.6</td>
</tr>
<tr>
<td>Cuneate saltbush</td>
<td>1.9</td>
</tr>
<tr>
<td>Cutler ephedra</td>
<td>0.6</td>
</tr>
<tr>
<td>Snakeweed</td>
<td>0.6</td>
</tr>
<tr>
<td>Low rabbitbrush</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Forbs</strong></td>
<td>4.2</td>
</tr>
<tr>
<td>Corymbed eriogonum</td>
<td>2.3</td>
</tr>
<tr>
<td>Northern sweetvetch</td>
<td>1.7</td>
</tr>
<tr>
<td>Galium</td>
<td>8.2</td>
</tr>
<tr>
<td><strong>Grasses</strong></td>
<td>9.0</td>
</tr>
<tr>
<td>Salina wildrye</td>
<td>5.8</td>
</tr>
<tr>
<td>Indian ricegrass</td>
<td>1.9</td>
</tr>
<tr>
<td>Bluebunch wheatgrass</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Total plant cover</strong></td>
<td>37.5</td>
</tr>
<tr>
<td>Litter</td>
<td>5.0</td>
</tr>
<tr>
<td>Rock</td>
<td>16.7</td>
</tr>
<tr>
<td>Bare ground</td>
<td>INCORPORATED</td>
</tr>
</tbody>
</table>

OCT 04 2010

Div. of Oil, Gas & Mining

Revised 11/21/83
Table 8. Shrub density and composition for the pinyon-juniper reference area at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Species</th>
<th>Composition, %</th>
<th>Density, No./Acre&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saskatoon serviceberry</td>
<td>61.0</td>
<td>891</td>
</tr>
<tr>
<td>Boome snakeweed</td>
<td>12.9</td>
<td>188</td>
</tr>
<tr>
<td>Low rabbitbrush</td>
<td>10.7</td>
<td>156</td>
</tr>
<tr>
<td>Mat prickly phlox</td>
<td>5.7</td>
<td>84</td>
</tr>
<tr>
<td>Shadscale</td>
<td>5.7</td>
<td>84</td>
</tr>
<tr>
<td>Cutler ephedra</td>
<td>2.0</td>
<td>29</td>
</tr>
<tr>
<td>Big sagebrush</td>
<td>2.0</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>1461</strong></td>
</tr>
</tbody>
</table>

<sup>1</sup>Mean area per plant is 2.77m<sup>2</sup> based on 35 observations.
Table 9. Tree size class (DBH) and number of trees found within each size class by species for the pinyon-juniper vegetation type reference site at the Wilberg Mine.

<table>
<thead>
<tr>
<th>Species</th>
<th>Diameter at Breast Height</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inches</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 - 4</td>
<td>4 - 10</td>
</tr>
<tr>
<td>Pinyon pine</td>
<td>49</td>
<td>1</td>
</tr>
<tr>
<td>Utah juniper</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>White fir</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>Limber pine</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>% of Total</td>
<td>89</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 10. Deer, elk and moose utilization on the Ferron Ranger District of the Manti-LaSal National Forest.

<table>
<thead>
<tr>
<th>Wildlife</th>
<th>Unit</th>
<th>High Priority(^1)</th>
<th>Winter(^2)</th>
<th>No.(^4)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer</td>
<td>34 N</td>
<td>Summer Range</td>
<td>6,500</td>
<td>274</td>
<td>289</td>
</tr>
<tr>
<td></td>
<td>35 S</td>
<td></td>
<td>5,450</td>
<td>282</td>
<td>297</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,055</td>
<td>73</td>
<td>65</td>
</tr>
<tr>
<td>Elk</td>
<td>Manti</td>
<td>Range</td>
<td>12,685</td>
<td>2,320</td>
<td>126</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical</td>
<td>1,040</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>Moose</td>
<td>Entire</td>
<td>Allotment (Year Long)</td>
<td>15,005</td>
<td>130</td>
<td>13</td>
</tr>
</tbody>
</table>

\(^1\)Total acres  
\(^2\)Total acres  
\(^3\)Animal unit month  
\(^4\)Total animals

INTEGRATED  
OCT 4 2010  
Div. of Oil, Gas & Mining
Table 11. Cattle utilization on the East Mountain allotment of the Ferron Ranger District, Manti-LaSal National Forest.

<table>
<thead>
<tr>
<th>Total Acres</th>
<th>Land Ownership</th>
<th>AUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,959</td>
<td>Private(^1)</td>
<td>845</td>
</tr>
<tr>
<td>19,328</td>
<td>USFS</td>
<td>1,710</td>
</tr>
</tbody>
</table>

\(^1\)Private land but still managed by the USFS
Productivity Measurements

Productivity measurements for the pinyon-juniper range type on steep slopes is not available. Data collection has been confined to the benches below these slopes because of their value to livestock. Very little, if any, livestock grazing occurs on these steep slopes, most of the forage use is by wildlife.

The current range condition of both the mine and waste rock reference areas is judged as fair when correlated with BLM’s assessment of the Grimes Allotments (Land Use Section 783.22). The opportunity for improvement is very limited because of the inherent characteristic of the pinyon-juniper overstory to inhibit understory development. Also, these steep sites are limited by the lack of soil and numerous rock masses.

Pinyon-Juniper Productivity

   Kenilworth very stony sandy loam, Lower Grimes Wash
   Wood Hill Range Site, Price, excellent condition
   (understory intact)
   900-1250 lbs./acre (dry weight)

2. U. S. Forest Service, Ferron Ranger District
   John Healy, Range Conservationist
   East Mtn. Allotment, two pinyon-juniper bench sites
   rated in 1982
   fair condition
   300-324 lbs./acre (dry weight)

3. Bureau of Land Management, San Rafael Planning Unit
   East and West Grimes Allotments, fair condition
   current stocking rates 60-100 lbs./acre (dry weight)

4. Bureau of Land Management,
   Letter Dated June 24, 1982. (See Land Use Section)

The productivity for the pinyon-juniper reference site on the steep slopes is estimated at 25-100 lbs./acre (dry weight). This is inferred from the data on the benches and comparisons of the sites.

---

1Fifty percent of the total forage production is the annual growth of the pinyon and juniper trees.

2Based on 800 lbs. forage = 1 AUM.
August 2, 1982

Mr. Jerry Barker  
C/O Bio Resources  
P. O. Box 3447  
Logan, Utah 84321

Dear Mr. Barker:

You have requested site, condition and production on 48.62 acres in Sections 34 and 35 of T 17S and R 7E North and West of Orangeville, Utah. The site is an Upland Stony Loam (Pinyon Juniper) D-34. The ecological condition is fair and the site is producing about 700 pounds of herbage per acre.

George S. Cook  
Range Conservationist
June 24, 1982

Mr. Jerry Barker
c/o Bio Resources
P. O. Box 3447
Logan, Utah 84321

Dear Mr. Barker:

You have requested information concerning Sections 34 and 35 of T. 17 S., R. 7 E.

The two sections are made up of three range sites:

1. Waste - Comprised mainly of cliff and rock outcrop areas.

2. Pinyon-Juniper - Made up of varying amounts of pinyon-juniper, saltbush, bitterbrush, Mormon tea, blacksage, mahogany and several grass species. Plant density is between 5-18% and plant vigor is considered weak for most forage species.

3. Desert saltbush - Made up of shadscale, mat saltbush, castle valley clover, Mormon tea, blacksage, and seven grass species including curlygrass, sandsage, Indian ricegrass, bull grass, and blue gramma. Plant density is between 0 and 20%.

Range condition could be estimated between fair and good. Vegetative production is low due to range site characteristics. Presently we have no current production or condition figures. There has not been any significant livestock use in the area for the last few years, due to the lack of water.

Our range survey, which was prior to 1966 indicates that Section 34 comprises 640 acres and has a carrying capacity of 9.7 AUM's. Section 35 comprises 640 acres and has a carrying capacity of 18.2 AUM's.

We hope this is the information you need.

Sincerely yours,

Div. of Oil, Gas & Mining
Acting Area Manager
July 19, 1982

Mr. Jerry Barker
Bio-Resources, Inc.
P.O. Box 3447
Logan, Utah 84321

RE: UP & L Wilberg Mine—Waste Rock Disposal Area

Dear Jerry:

In response to your request for wildlife information concerning the waste rock disposal area for Utah Power and Light Company near the Wilberg Mine, the site represents high-priority valued winter range for mule deer. The assessment of wildlife and recommended mitigation planning provided by the Division to Chris Shingleton (UPandL) on March 2, 1981 should be considered satisfactory for this site. It is anticipated that UPandL will develop an acceptable mitigation plan for their activities as they relate to the rock disposal area.

If the Division can be of further service, please coordinate with Larry Dalton (telephone 637-3310) as appropriate.

Sincerely,

John Livesay, Supervisor
Southeastern Region

cc: Darrell Nish
Chris Shingleton
Utah Division of Oil, Gas and Mining
FISH AND WILDLIFE RESOURCES INFORMATION

As required by the regulations the application has consulted with the D.O.G.M., the D.O.W.R. and U. S. Fish & Wildlife Service. An on-site field investigation of each mine site was conducted. In addition, the applicant felt to properly mitigate wildlife concerns a consultant (Jarvis) was retained to provide both wildlife baseline information and, in consultation with the U. S. Fish & Wildlife Service, initiate any necessary studies and identify any possible conflicts between wildlife and mining operations. This report is included in this section. Notwithstanding Judge Flannery's decision, applicant feels that without baseline data a proper wildlife mitigation plan cannot be developed.

As the Jarvis report and the D.O.W.R. baseline data are for the most part redundant, applicant has chosen to include only the consultant's report in this application but has included the mitigation and impact avoidance procedures as recommended by the D.O.W.R. in the Fish & Wildlife Protection Plan. The applicant has the D.O.W.R. complete baseline studies on file and copies have been sent to all concerned state and federal management agencies.

Mine Plan Area

The PacifiCorp lease area covers the south half of East Mountain in the Wasatch Plateau. Life zones range from Upper Sonoran below the mines to Canadian on top. The three mines are located in steep rocky canyons on the south and east slopes of the mountain.

Wildlife Habitats

The habitats within the mine plan are rated as 1 and 2 by Bob Scott and others for coal lands of Utah (Scott, 1977). Around the mines the cliffs are considered raptor nesting habitat with the slopes below and the flat lands above the cliffs as raptor feeding areas. The lower slopes and alluvial fans below the mines are rated as deer winter range. All elk range is shown on Figure 1 in Map Packet 2-20.

The habitats at the portals in Cottonwood Canyon, Cottonwood/Wilberg Mine and Des-Bee-Dove Mines are designated as pinyon-juniper with many open rock and cliff areas. At the Deer Creek Mine some riparian habitat exists along Deer Creek below the mine. The south facing slopes of this steep canyon are covered with pinyon-juniper -and the north facing slopes are covered with a
mixed conifer stand.

The habitat designations are listed below:

s  -  Sagebrush
G  -  Grassland
SD -  Salt Desert Shrubs
R  -  Riparian
P-J -  Pinyon-Juniper
MC -  Mixed Conifer (includes Aspen Groves)

a. **Sagebrush** - All the sagebrush communities are situated between 8,000 and 10,000 foot elevations along the top of the East Mountain plateau. They exist as short sage communities generally on ridge tops and flats. Aspen-groves are scattered through the sagebrush communities on the flats and along the edges. A few areas around springs still harbor small wet meadows.

b. **Grassland** - Two small areas on ridges in tributaries of Cottonwood Creek.

c. **Salt Desert Shrub** - This plant community is located on the lower slopes adjacent to the access road to the Des-Bee-Dove Mines.

d. **Riparian** - The streams are small and flow through steep narrow canyons. Consequently the riparian zone is very narrow often less than 30 yards wide. The vegetative composition varies from the broad-leaved trees and shrub plant community normally depicted as characteristic of riparian areas to many areas where there is only an increased density of conifers and/or aspen.

e. **Pinyon-juniper** - This pygmy forest is located on steep slopes and talus slides that are crowned by near vertical to vertical rock escarpments. In many areas especially on the south face of East Mountain the forest consists of scattered trees growing amidst huge rocky cliffs and rough rockpiles. Where steep canyons occur the pinyon-juniper forest is only found on south facing slopes or on rocky exposed ridges. In many areas where the pinyon-juniper grades into the mixed conifer stands a mountain brush plant community, exists as an ecotone between the two tree dominated plant communities. These areas are generally confined to a single slope of less than 200 acres.
f. Mixed Conifer - The mixed community is spread all over East Mountain, on the top, the slopes, and in the steep side canyons. Below 8,000 feet elevation conifers are found only on north facing slopes in steep canyons. Fir species generally dominate the stands along with spruce and a scattering of aspens at the sagebrush interface.

Species of Special Significance

The species listed here and their habitat requirements are discussed in the following paragraphs. This list was derived from Utah Division of Oil, Gas and Mining's guidelines and from Utah Division of Wildlife Resources' status list (DOGM, 1980 and UDWR, 1979).

Table 1: Species List of the Wasatch Plateau

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Habitat</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Bluebird (Sialia mexicana)</td>
<td>Federal</td>
<td>MC, P-J</td>
<td>Probably occurs within disturbed area</td>
</tr>
<tr>
<td>American Peregrine Falcon (Falco peregrinus)</td>
<td>T&amp;E</td>
<td>All</td>
<td>Does not occur, no sightings</td>
</tr>
<tr>
<td>Bald Eagle (Haliaeetus leucocephalus)</td>
<td>T&amp;E</td>
<td>All</td>
<td>Winter visitor</td>
</tr>
<tr>
<td>Showshoe Hare (Lepus americanus)</td>
<td>DWR</td>
<td>MC</td>
<td>Probably occurs on permit area but not in disturbed area</td>
</tr>
<tr>
<td>Northern Flying Squirrel (Glaucomys sabrinus)</td>
<td>DWR</td>
<td>MC</td>
<td>Probably occurs on permit area but not in disturbed area</td>
</tr>
<tr>
<td>Red Bat (Lasiurus cinereus)</td>
<td>DWR</td>
<td>MC</td>
<td>Probably occurs on permit area but not in disturbed area</td>
</tr>
<tr>
<td>Utah Mountain Kingsnake (Lampropeltis pyromelana)</td>
<td>DWR</td>
<td>R, P-J, MC</td>
<td>Probably occurs in the disturbed area</td>
</tr>
<tr>
<td>Utah Milksnake (Lampropeltis triangulum)</td>
<td>DWR</td>
<td>MC</td>
<td>Probably occurs on permit area but not in disturbed area</td>
</tr>
<tr>
<td>Tiger Salamander (Ambystoma tigrinum)</td>
<td>DWR</td>
<td>R</td>
<td>Probably occurs on permit area but not in disturbed area</td>
</tr>
</tbody>
</table>

Threatened and Endangered

A letter from U. S. Fish and Wildlife Service dated November 6, 1980. "To the best of our knowledge, no endangered or threatened plant species or critical habitat for threatened, or endangered wildlife species occur in the disturbed areas of the subject mining operations.

Effects of Mining Operations on Fish and Wildlife

The effects of mining on wildlife are being evaluated through various studies being conducted by the Mining Division. A major study was implemented at the Cottonwood Mine. The Cottonwood
Mine Escarpment Study, developed by the Mining Division, in cooperation with the BLM, USFS, and DOGM. The objects of the study were to develop a geotechnical model for predicting escarpment failure, identify impacts to resources and develop effective mitigation measures for identified impacts. Results of the study were reported annually as the study progressed. The primary habitat losses have been raptor nesting sites and deer winter range.

The lower open slopes are used by raptors on the escarpment face for hunting activities where an abundance of rodents and small birds provide a prey base. Wintering migrants also utilize these same habitats for hunting. The vehicle traffic and human presence appears not to have disrupted the natural hunting patterns. Data from the period prior to mining lacked to evaluate the present situation.

The traffic on the Mine access roads kills approximately eight (8) deer each year. This is not considered significant by DWR (personal communication with Larry Dalton). Mining impacts on golden eagles have been studied since 1986 in Newberry Canyon. No significant impacts have been identified to date. Nesting and production of young has continued uninterrupted (see Annual Monitoring Reports and Assessment of Mining Related Impacts in Newberry Canyon).

An assessment of deer use on the BLM portion of the permit area was initiated by the BLM in 1989. This investigation was continued as part of the Cottonwood Mine Escarpment study. Data collection and analysis was done in accordance with Interagency (BLM, USES, DWR) Guidelines.

Fish and Wildlife in Cottonwood Canyon
The portal area in the Cottonwood Canyon is in pinyon-juniper habitat. A number of important vertebrate species are typical of this habitat within the region. The sparse vegetation and steep, dry conditions present at the portal are less suitable for wildlife than are densely vegetated portions of pinyon-juniper habitat on gently sloping terrain south and east of the mine property.

The mule deer is the most conspicuous large mammal in pinyon-juniper habitat in the mine vicinity. Other mammal species found in this habitat include black-tailed jackrabbit, mountain
Cottonwood/Wilberg Mines

cottontail, coyote, badger, striped skunk, deer mouse, pinyon mouse, least chipmunk, hoary bat, and western big-eared bat (Brown et al, 1958).

Typical birds in pinyon-juniper habitat include the mourning dove, pinyon jay, western bluebird, western kingbird, American kestrel, and chipping sparrow (Brown et al, 1958). Chukar partridge inhabit the rocky escarpment areas near the Cottonwood/Wilberg portal area.

Dry surface conditions and the absence of standing water virtually preclude the presence of amphibians from pinyon-juniper habitat in the vicinity of the mine, but several reptile species are common. The side-blotched lizard, eastern fence lizard, sagebrush lizard, racer, gopher snake, and western rattlesnake are representative species in this habitat type throughout the region (Stebbins, 1966).

Open stands of spruce-fir-Douglas fir forest with Douglas fir as a dominant species occur on sheltered north facing slopes at higher elevations within the mine property. Spruce-fir-Douglas fir and pinyon-juniper habitats intermingle in canyon bottoms and at intermediate elevations to form a transition zone between the two vegetation types. Aspen groves in the spruce-fir-Douglas fir communities offer excellent calving areas for elk (U.S. Forest Service, 1976). Mule deer, snowshoe hare, and blue grouse are important game species in forested areas. Non-game mammals which inhabit forest areas include bobcat, beaver, porcupine, red fox, coyote, mountain vole, deer mouse, hoary bat, and silver-haired bat.

Many bird species frequent the forested portions of the mine property. Conspicuous breeding birds include band-tailed pigeon, plain titmouse, Clark's nutcracker, raven, turkey vulture, great horned owl, red-tailed hawk, and golden eagle.

Amphibian species such as the chorus frog and western toad inhabit mesic areas of the site. Reptiles are probably not abundant, but the short-horned lizard, sagebrush lizard, gopher snake, and western terrestrial garter snake inhabit sagebrush and forests-sagebrush ecotones in the site region.

Sagebrush and grassland habitat, and some mesic vegetation types occur on the relatively flat upper
Cottonwood/Wilberg Mines

benches of East Mountain. Meadow habitat is limited to small drainage areas and a few springs. These habitats, combined with the forest edge ecotonal areas, are suitable for elk, mule deer, sage grouse, ruffed grouse, blue grouse, and snowshoe hare.

Fishery
Cottonwood Creek within Cottonwood Canyon is considered a non-fishery until its junction with Straight Canyon four miles downstream from the project site where it is joined with waters from Joe's Valley Reservoir and is planted with fingerling trout.

Refer to Final Environmental Statement Emery Units 3 and 4.

Game Species

**Mule Deer (odocoileus hemionus)** - Mule deer range throughout all habitats on the mine property. Pinyon-juniper on the slopes of East Mountain is used as winter range. During other seasons deer concentrations are greater at high elevations. Although deer populations have declined over the past several years, the deer herd and habitat in the mine vicinity are in good condition (Dalton, 1977).

**Elk (Cervus canadensis)** - Elk inhabit the sagebrush, and forest areas at the upper elevations on East Mountain, but do not ordinarily range into pinyon-juniper habitat. The seven year average of elk censured on East Mountain (1970-1976) was 76 antlerless and two antlered individuals seen per year (Dalton, 1977). This census included larger groups only and does not reflect a total population estimate (Dalton, 1977).

**Mountain Lion (Felis concolor)** - This species inhabits rugged mountains and forest areas in the region and may occasionally occur on East Mountain (Dalton, 1977).

**Snowshoe Hare (Lepus americanus)** - This species occurs in forested portions of mountainous areas in the region. It inhabits higher elevations on East Mountain (Dalton, 1977).
Mountain Cottontail (*Sylvilagus nuttalli*) - Mountain cottontails inhabit brushy areas and forests, particularly on rocky slopes throughout the mine region (USDI Bureau of Land Management, 1976).

Blue Grouse (*Dendragapus obscurus*) - Open conifer stands with brushy understory at higher elevations provide suitable habitat for this species. Blue grouse occur on East Mountain. The greatest density of the species in Utah is in the northern Wasatch Range (Rawley and Bailey, 1972).

Ruffed Grouse (*Bonasa umbellus*) - Bushy woodlands (aspens, willows, and conifers) near streams and springs are suitable habitat. This species occurs at higher elevations on East Mountain, but good populations are generally limited to the Wasatch Range northwest of the mine property (Rawley and Bailey, 1972).

Chukar Partridge (*Alectoris graeca*) - This species prefers steep, rock, semiarid slopes with low shrubs and rock outcrops. This species was introduced in Utah from 1951 to 1968. During this period 185,911 individuals were released at 191 different locations (Rawley and Bailey, 1972). The species is now widely distributed throughout Utah and other western states.

Mourning Dove (*Zenaidura macroura*) - This is an important game bird in many parts of North America. Mourning doves prefer open field and forest edge habitat, but occur over a broad range of vegetation types throughout the 48 conterminous United States. The species occurs in pinyon-juniper and forest edge habitat on East Mountain.

**Special Status Species**

No federally listed endangered or threatened species are known to occur on the site property (USDI, Fish and Wildlife Service, 1976). The black-footed ferret (*Mustela nigripes*), a federally endangered species, has recently been reported near Ferron, several miles south of the site (Dalton, 1977). This species is not likely to occur on mine property because preferred habitat (a prairie dog town) (USDI Bureau of Land Management, 1972) is not present. American peregrine falcon
Cottonwood/Wilberg Mines

(Falco peregrinus anatum) has been observed with 25 miles of the site in the winter of each of the past three years (Dalton, 1977). It is probably a winter visitor in the area (USDI Bureau of Land Management, 1972b), although, historically peregrine falcon aeries existed in the San Rafael swell area 30 miles southeast of the site.

The State of Utah has defined the status of selected animal species (Utah Division of Wildlife Resources 1976), some of which are likely to occur on or near the Wilberg Mine property as:

DECLINING: Any species of animal which, although still occurring in numbers adequate for survival, has been greatly depleted and continues to decline. A management program included protection or habitat manipulation, is needed to stop or reverse the decline.

LIMITED: Any species of animal occurring in limited numbers due to restricted or specialized habitat or at the perimeter of its historic range.
STATUS QUESTIONED: Insufficient data area available to permit a reliable assessment of the status of the species. Special status species in Utah that might be found near the mine property are:

Bobcat (Lynx rufus) Declining. Fur prices in recent years have resulted in high harvests. The species is presently under consideration for total protection until the current population trend is reversed. Bobcats probably occasionally use the habitats present on the mine property.

Sandhill Crane (Grus canadensis) Limited. A few individual migrate through the region (Robbins et al, 1966).

Fox Sparrow (Passerella iliaca) Status questioned. Suitable habitat for the species occurs at upper elevations on East Mountain on the mine property.

Utah Mountain Kingsnake (Lampropeltis pyromelana infralabialis) Limited. Suitable habitat occurs on site. The species is in the region and may inhabit the mine area (Stebbins, 1966).

LAND USE INFORMATION

Historically, man's first sustained use of the land was grazing by early settlers. Due to the inaccessible reaches of the coal seam in the Grimes Wash area, it is expected that coal mining of a serious nature occurred after the turn of the century in the form of a wagon mine for local
Cottonwood/Wilberg Mines

consumption. Wilberg derives its name from an early mine owner of federal record, Cyrus Wilberg, who mined this area briefly (1944).

Topography of the general area dictated its uses; i.e., the lower valleys provided year-round farming and ranching and the higher sediments of the Wasatch Plateau were utilized for summer grazing as it is today.

Grimes is a small canyon enclosed by steep barren cliffs with no access to the upper reaches of East Mountain. Two drainages are junctional at the mine site. The left and right forks compose what is known as Grimes Wash which flows across approximately five miles of Mancos Shale prior to its juncture with Cottonwood Creek.

Currently on the BLM lands in the permit area, the livestock use is spring grazing with cattle on the benches (April 1 - June 10). The East Grimes and West Grimes allotments are stocked at 19.4 acres/AUM and 16 acres/AUM for a total of 317 and 263 AUM's respectively. These allotments are judged in fair condition with a downward trend (BLM letter 6/24/82).

Very little grazing by cattle occurs on the steep slopes above the benches because of the difficult access and scarcity of forage.

The grazing of the USES lands is confined to East Mountain under an approved rest rotation system (USES, 1979). Nine permits graze 486 cattle from June 21 to September 10 for a total of 1,296 AUM'S. The range condition is judged “good” with a static to upward trend. The stocking rate is 11 acres/AUM.

Elk use East Mountain for summer range but winter on the western slopes in the Cottonwood Creek drainage. Mule deer also summer on the mountain and winter on the benches and slopes of the southern and eastern portion of East Mountain from the mouth of Cottonwood Creek around to Rilda Canyon in the Huntington Creek drainage. These ranges are rated as high priority winter range by Utah Division of wildlife Resources. Current herd management levels are one deer/20 acres of inter-range (UDWR, 1982).
The total forage productivity of the pinyon-juniper range on the benches is 100-324 lbs/acre, dry weight. The pinyon-juniper range on the rock land soils of the steep slopes is lower, estimated 25-100 lbs/acre, dry weight. See Vegetation Section for productivity details.

The BLM also recognizes the sand and gravel resources on these benches and has designated specific areas for excavation and processing to aid in community expansion. The BLM visual resource management system rates the benches as Class IV and the cliff faces as Class III. Both of these classifications allow for modification of the land through man's activities. The USES also rates the south end of East Mountain as modification or partial retention, a scenic value similar to BLM's Class IV and III respectively.

The Land Use Plans for the Wasatch Plateau designate dispersed recreation and limited commercial timber on East Mountain in addition to big game range and protection of watersheds.

Six gas-producing wells have been developed in Cottonwood Canyon just west of the mine permit area. The wells are within the East Mountain Unit operated by Meridian Oil Co. The East Mountain Unit overlaps the mine permit area; therefore, future development by Meridian Oil Co. may take place within the mine permit area.

Prior mining consisted of a small wagon mine (Wilberg) 1944 through 1958. Coal was extracted from the Hiawatha Seam by conventional methods. Activities were confined to Lease SL-064900. An estimated 107,000 tons were removed.

Pre-mining use of the land was for livestock grazing and wildlife habitat with some occasional timber cutting on top of East Mountain (see Land Use Map 2-19).

Final reclamation of the Cottonwood/Wilberg Mine was completed in March 2018. No active mining occurred in the Grimes Wash area since portals were sealed in 2001.
REFERENCES


Emery County, Zoning Plat Books, Castle Dale, Utah


Emery County Zoning

A-1 Agricultural Zone, contains the primary farming areas of the county.

RA-1 Residential-Agricultural Zone, this is the area with the communities and the adjacent or intermixed agricultural lands.

M&G-1 Mining and Grazing Zone, all of the county lands outside of the communities, farming areas and forest service boundary.

I-1 Industrial Zone, specific areas near communities and highways reserved for industrial development.

Ce-1 Critical Environmental Zone, general designation for all private lands within the forest boundary.

Ce-2 Critical Environmental Zone, specific designation for certain land parcels especially those adjacent to recreation site in the forest.

Land Use of the Portals in Cottonwood Canyon

The portal area in Cottonwood Canyon has been the site of an earlier coal mining operation, the Johnson Mine. This earlier mine was opened in 1945 and mining methods were conventional for that period. The Hiawatha coal seam was mined until 1955. The extent of the coal removed was not documented (personal communication, Neldon Sitterud, August 1979).

The area across the canyon exists a coal mine, Trail Mountain Mine. Mining, stockpiling, and
Cottonwood/Wilberg Mines

Shipping coal occurred on that site, however operations ceased at this site in 2001. The site is currently owned by Wolverine Fuels, LLC. The name of the mine was changed to Fossil Rock Fuels.

The land use preceding mining was wildlife habitat. The vegetation reestablished after mining is representative of the Pinyon-juniper sites with good reestablishment of local forage species.

Land in the vicinity of the portals in Cottonwood Canyon is used primarily for spring and winter range forage, wildlife habitat and mineral mining. Historically, the area has been used for wildlife habitat.

The present land use of wildlife habitat utilizes the surface lands at their highest capability in the Cottonwood Canyon area. Factors which support this conclusion are shallow, coarse textured soils, large amounts of rock outcrop, steep terrain (70-80%), low soil water-holding capacity and low amounts of total annual precipitation.

Vegetation sites on the lower canyon area vary from the semi-desert alkali flat (Greasewood - Soil pH 9.2) with a land classification of capability unit VII's - SX, to the semi-desert stoney loam (pinyon-juniper) range site also with the range site capability unit of VII's - SX.

A site specific investigation, conducted with the Soil Conservation Service Range Specialist in July 1979, indicated that the condition of the range and vegetation in the lower Cottonwood Canyon is fair. The capability level of this area varies. The Cottonwood Canyon portal area is covered under vegetation sites 1 and 2 and has the estimated capability of producing 1,000 pounds/acre with a presently estimated production level of 1,000 pounds/acre of forage.

The Carbon - Emery Soil Survey (USDA, SCS, 1979) expresses the capability unit VII's - SX in the following way:

Permeability is moderate to rapid, and natural fertility is moderate to low. The susceptibility to sheet erosion is moderate; some gullies have formed. The soils retain about four inches of water but are dry most of the time.
Cottonwood/Wilberg Mines

These soils are used for range and are suited to that purpose. Reseeding of grasses and clearing of brush or other mechanical practices that would improve the range are not feasible.

There is Douglas Fir and White Fir on the portal site. The timber value of the trees in this area is minimal and classified non-commercial due to inaccessibility, size-class distribution and marketing conditions that limit the economic feasibility of commercial operation.

Note: The portals in Cottonwood Canyon were sealed in 2001. No active mining operations have occurred in the canyon since that time. The proposed fan portal area was reclaimed in 1999 and received bond release in 2009. The remainder of the disturbed area, namely the Trail Mountain Access (TMA) portal and belt portal areas were reclaimed in 2014.

PRIME FARMLAND INVESTIGATION

After investigating all the lands within the permit boundaries of the Wilberg Coal Mine it is determined that these lands do not qualify as "prime farmlands" for the following reasons:

1. Historically the lands prior to construction were not used as crop land.
2. The slopes of and surrounding the portal area exceed 10 percent.
3. There is no developed water supply qualifying as an irrigation source.

In keeping with the regulations, applicant requests the Division to make a negative determination. Applicant has contacted the Soil Conservation Service (Mr. Beardall) in Price, Utah. They are aware of the mining company's need for negative determinations for permitting. No soil mapping is published in the area of Utah Power & Light Company coal mines.

It was requested by Mr. Beardall that a map of the three mines, with a request for a soil survey, be submitted for determination. The findings would be forwarded to the Division.

ALLUVIAL VALLEY FLOORS (785.19)

The statutory definition of alluvial valley floors is as follows: "alluvial valley floor" means the unconsolidated stream laid deposits holding the streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet
erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass
movement accumulation and windblown deposits. "The surface facilities located at the Deer
Creek, Wilberg, and Church underground mines are situated in relatively narrow canyons which
slope up directly from the draining stream. The canyons lack any soil development and do not
contain irrigatable land which could be used for agricultural purposes. The canyons in which the
surface facilities are located contain deposits of mass movements, slope wash, debris erosion and
sheet runoff. The area is classified as an upland and non-irrigation area and, therefore, cannot be
considered as an alluvial valley floor. Furthermore, disturbance or interruption of aquifers within
the underground mine complex will have no effect on downstream alluvial valley floors, insomuch
as the water will eventually reach the downstream portions of the drainage system through one
system or another.

HYDROLOGY AND GEOLOGY GENERAL REQUIREMENTS
The Cottonwood/Wilberg Mine area is located in the central portion of the Wasatch Plateau Coal
Field in Emery County, Utah (Figure 2-1). Generally, this area is a flat-topped mesa surrounded
by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. The
plateau generally has a vertical relief of up to 2,500 feet, rising from Castle Valley below. The
following discussion summarizes the structural geology, stratigraphy, hydrology, and economic
coal deposits of the region and the Wilberg Mine area.

Data Collection
PacifiCorp has been collecting data regarding the Wilberg Mine area and adjacent properties since
1971. As a result, 118 exploration drill holes have been completed from the surface wherein data
were collected regarding the coal seams and enclosing strata (see Map 2-1).

Nine of these holes were core drilled through the coal zone and all were geophysically logged.
Generally, these surface holes are located on about 1/2 to 3/4 mile centers. In addition to these
holes, approximately 475 holes have been drilled from within the mines which provide valuable
data on as close as 500 foot centers.

The coal seams exposed on outcrop and within the mine workings have been mapped in detail
providing data which is valuable in understanding the coal geology.
The interpretations made herein are based on data collected from all of the above sources in addition to the published regional data. All of these data allow the construction of a geologic and hydrologic model which represents the conditions present in the area of the Cottonwood/Wilberg Mine and surrounding areas.

The applicant has made a practice of submitting to the BLM, each year, copies of both lithologic and geophysical logs of all drill holes, surface and underground, which were drilled within federal leases or on fee land. At the time the mine permit was completed, copies of all logs had been submitted to the BLM.

Structure
The geologic structure of the Cottonwood/Wilberg Mine area is fairly simple. The strata are gently down-folded in the area of the Straight Canyon syncline which is present in the northwest portion of the Cottonwood/Wilberg Mine area (see Map 2-2). Dips in the syncline range from two to six degrees with the north limb dipping the steepest.

The Hiawatha Seam generally strikes N60 E and dips one to three degrees in a northwest direction throughout the area of the current Cottonwood/Wilberg Mine workings. However, to the northwest of the Straight Canyon syncline both the Hiawatha and Blind Canyon Seam dip in a southeast direction at three to five degrees. The dip and strike of the coal seams can be better visualized on Map 2-2 which is included herein.

The strata within the property have been offset by a series of north-south trending fault zones. Generally, these faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in the Wilberg Mine (refer to Map 2-2).

The Pleasant Valley Fault consists of two parallel fractures which are about 150 feet apart (see Map 2-2 and cross sections 2-3). Its total displacement, where it was intersected in the Deer Creek Mine to the north is 150 feet with its downthrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine.
Cottonwood/Wilberg Mines

Another north-south trending fault is present to the east of the Pleasant Valley Fault. This fault, the Deer Creek Fault, limits the eastward development of the Wilberg Mine. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being downthrown.

A fault system has been identified within the Wilberg Mine area which trends in a northeast-southwest direction along the Straight Canyon synclinal axis (see Map 2-2). In the northeast corner of federal lease U-084923, this structure called the Roans Canyon Fault graben, consists of up to six normal faults with displacements up to sixty-five feet.

Stratigraphy

The rock formations exposed in the Cottonwood/Wilberg Mine area range from Upper Cretaceous to Tertiary in age (see Figure 2-2). These formations in ascending order are the Masuk shale member of the Mancos Shale, Starpoint Sandstone, Blackhawk, Castlegate Sandstone, Price River, North Horn, and Flagstaff Formations. The coal deposits are restricted to the lower portions of the Blackhawk Formation.

The Masuk Shale is the upper member of the Mancos Shale. It consists of light to medium gray marine mudstones. Usually this formation weathers readily forming slopes which are often covered by debris. This formation is generally devoid of water.

Starpoint Sandstone

Overlying and intertonguing with the Masuk Shale is the Starpoint Sandstone. In this area the Starpoint consists of three or more cliff-forming massive sandstones totaling about 400 feet in thickness. Generally, they are fine to medium-grained and moderately well-sorted. The upper contact of the Starpoint is usually quite abrupt and readily identifiable on the outcrop. Locally, the Starpoint Sandstone exhibits aquifer characteristics.

Blackhawk Formation

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are
### Figure 2-2

**Stratigraphy of East Mountain**  
*(Doelling, 1972)*

<table>
<thead>
<tr>
<th>System</th>
<th>Series</th>
<th>Stratigraphic Unit</th>
<th>Thickness (feet)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eocene</td>
<td>Green River Formation</td>
<td>-</td>
<td>Varicolored Shale with Sandstone and limestone lenses, thickness to the north.</td>
<td></td>
</tr>
<tr>
<td>Paleocene</td>
<td>Wasatch Group</td>
<td>Colton Formation</td>
<td>300-1,500</td>
<td>Dark yellow-gray to cream limestone, evenly bedded with minor amounts of sandstone, shale, and volcanic ash, ledge former.</td>
</tr>
<tr>
<td></td>
<td>Flagstaff Limestone</td>
<td>200 - 1,500</td>
<td></td>
<td>Variegated shales with subordinate sandstone, conglomerate and freshwater limestone, thicknesses to north, slope former.</td>
</tr>
<tr>
<td>Maestrichtian</td>
<td>North Horn Formation (Lower Wasatch)</td>
<td>500 - 2,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cretaceous</td>
<td>Price River Formation</td>
<td>600 - 1,000</td>
<td>Gray to white gritty sandstone interbedded with subordinate shale and conglomerate, ledge and slope former.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Castlegate Sandstone</td>
<td>150 - 500</td>
<td>White to gray, coarse-grained often conglomeratic sandstone, cleft former, weathers to shades of brown.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blackhawk Formation MAJOR COAL SEAMS</td>
<td>700 - 1,000</td>
<td>Yellow to gray, fine- to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick coal seams.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Star Point Sandstone</td>
<td>90 - 1,000</td>
<td>Yellow-gray massive clift-forming sandstone, often in several tongues separated by Masuk Shale, thickness westward.</td>
<td></td>
</tr>
<tr>
<td>Santonian</td>
<td>Masuk Shale</td>
<td>300 - 1,300</td>
<td>Yellow to blue-gray sandy shale, slope former, thick in north and central plateau area, thins southward.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emery Sandstone COAL (9)</td>
<td>50 - 800</td>
<td>Yellow-gray friable sandstone tongue or tongues, cleft former, may contain coal (?) in south part of plateau if mapping is correct, thicknesses to west and south. Coal may be present in subsurface to west.</td>
<td></td>
</tr>
<tr>
<td>Coniacian</td>
<td>Minersville Shale</td>
<td>1,500 - 2,400</td>
<td>Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into low rolling hill and badlands, thickens northerly.</td>
<td></td>
</tr>
<tr>
<td>Turonian</td>
<td>Blue Gate Member</td>
<td>1,500</td>
<td>Alternating yellow-gray sandstone, sandy shale and gray shale with important coal beds of Emery coal field, resistant cleft former, thickens to south.</td>
<td></td>
</tr>
<tr>
<td>Cenomanian</td>
<td>Ferron Sandstone Member MAJOR COAL SEAMS</td>
<td>50 - 850</td>
<td>Blue-gray to black sandy marine slope forming mudstone.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tununk Shale Member</td>
<td>400 - 850</td>
<td>Variable assemblages of yellow-gray sandstone, conglomerate shale and coal. Beds lenticular and discontinuous.</td>
<td></td>
</tr>
<tr>
<td>Albion</td>
<td>Dakota Sandstone MINOR COAL</td>
<td>0 - 80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Generalized section of rock formations, Wasatch Plateau coal fields.

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Part 2 - Environmental Resources

2/5/2019

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Cottonwood/Wilberg Mines

restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation. Many of these tabular sandstone channels form local perched water tables. The total thickness of the Blackhawk Formation in the Cottonwood/Wilberg Mine area is about 750 feet.

Cas tlegate Sandstone

The Castlegate Sandstone generally caps the escarpment which surrounds the mine portal area. The Castlegate consists of about 250 feet of coarse-grained, light-gray, fluvial sandstones, pebble conglomerates, and subordinate zones of mudstones. Although this sandstone is very permeable, it lacks water because of insufficient recharge.

Price River Formation

The Price River Formation overlies the Castlegate Sandstone. The formation is about 500 feet thick and forms slopes which extend upward from the Castlegate escarpment. Fine-grained, poorly sorted, sandstones dominate the Price River Formation but some mudstones are present. The Price River Formation generally lacks water.

North Horn Formation

The North Horn Formation is about 850 to 900 feet thick in the Cottonwood/Wilberg Mine area. Mudstones dominate the rock types present. These mudstones are generally grey to light brown in color. Localized, lenticular sandstone channels are present in this formation throughout. These sandstone beds are more common near the upper and lower contacts of the formation and many times host localized perched water tables.

Flagstaff Formation

The youngest formation exposed in the area is the Flagstaff Formation. It consists of white to light-gray, lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains forming a cap on the highest plateaus of the area. The formation is fairly well fractured allowing surface water to percolate down to lower strata.

Economic Coal Occurrences

Three economic coal seams were present on the property which hosts the Cottonwood/Wilberg
Cottonwood/Wilberg Mines

Mine: the Hiawatha, Cottonwood, and the Blind Canyon Seams. All active mining operations occurred in the basal or Hiawatha Seam.

Hiawatha Seam
The Hiawatha Seam is of minable thickness in both the southern and extreme northern portions of the East Mountain property (see Map 2-4). This seam which rests directly on the Starpoint Sandstone ranges in thickness from 16 feet to less than 5 feet. The Hiawatha Seam is not present throughout a major portion of the property. This lack of coal is due to a major distributary river channel which flowed through the coal swamp in an easterly direction.

Blind Canyon Seam
The second major minable seam on the Cottonwood/Wilberg Mine property is the Blind Canyon Seam. This seam is located from 14 to 140 feet above the Hiawatha Seam (see Map 2-5). The average separation between these seams is 70 to 80 feet but does increase up to 140 feet in the southern portion of the property. The Blind Canyon Seam is of minable thickness through most of the permit area and in part is mined through the Deer Creek Mine (see Map 2-6). This seam ranges in thickness from 16 feet to less than 5 feet. The thickness of the seam thins to less than 5 feet in the southwest portion of the property.

Cottonwood Seam
The Cottonwood Seam is located stratigraphically between the Hiawatha and Blind Canyon Seams. This seam is located generally about 70 to 90 feet above the Hiawatha Seam (see Map 2-7) but is found in minable thickness only in the south half of lease U-47978.

Overburden
The coal reserves in the Wilberg Mine area within the Hiawatha Seam are covered by up to 2,300 feet of overburden. Because the topography of these lands displays much relief, the thickness of the overburden is highly variable (see Maps 2-10, 2-11 and cross sections 2-3). The overburden is the greatest in the western and northern portions of the property where the plateau is capped with the Flagstaff Limestone. In these areas the overburden ranges from 2,200 - 2,300 feet. However, the overburden above most of the coal is less than 1,800 feet.
Chemical Composition

In the development of the Cottonwood/Wilberg Mines and associated surface facilities, some of the strata and alluvium covering the coal seam was excavated to accommodate the facilities. In order to better understand the chemical and physical characteristics of the rock material that was excavated, over 130 samples from both outcrop and core from drill holes were analyzed.

Four drill holes were selected as data points in which core samples were analyzed for their chemical and physical properties (see Figure 2-4). These core drill holes were selected to give the best representation of the same rock sequence which was excavated at the Cottonwood/Wilberg Mine portals and that which will be excavated during the mines life. Two of the holes were drilled from the surface of East Mountain (EM-12C and EM-23C), and two of the holes were drilled from within the Deer Creek and Wilberg Mines (A-25 and B-124).

Samples of rock core were collected from each lithologic unit that was penetrated within the selected drill holes. These samples consisted of a representative section of core averaging 0.3' in length usually taken from the center of each lithologic unit. Samples of rocks which were immediately overlain by minable coal seams were collected at the coal seam contact. The rock zones sampled and the sample numbers are shown on the core logs for each drill hole (see core logs in Appendix VI.)

In light of the recommendation made by the Office of Surface Mining (OSM) each sample was analyzed for the following:

- pH
- EC (electrical conductivity)
- % Calcium
- % Sodium
- % Magnesium
- SAR (Sodium Absorption Ratio)
- % Iron
- % Zinc
- % Sulfate
- % Molybdenum
- % Boron
- Alkalinity (Equivalent CACO₃)

All of the samples of carbonaceous mudstone that were collected were also analyzed for their percent pyrite/marcasite content. The samples collected from immediately below a minable coal
Cottonwood/Wilberg Mines

seam were analyzed for their clay content. In addition to these analyses, four or five representative samples of each of the rock types present, sandstone, siltstone, mudstone, interbeds (thinly laminated siltstone and mudstone), carbonaceous mudstone, and coal were tested for their physical properties. These samples were crushed to a size of -1/4" mesh and the product was screened for its percent sand, silt and clay content.

Front Range Labs, Inc., of Fort Collins, Colorado, was selected to do the analytical work because of their expertise in testing the chemical and physical properties of coal overburden and their ability to perform all of the required analytical work.

PacifiCorp had previously established an excellent data base regarding the coal quality within the East Mountain property. Since 1979, samples have been collected from within the Deer Creek and Cottonwood/Wilberg Mines on a daily basis. These samples were analyzed by Standard Laboratories, Inc., in Huntington, Utah prior to 1987 and by CT&E, in Huntington, Utah since that time. Some of the data reported herein have been gleaned from this work.

The findings of these analyses are separated by formation, rock type and coal seam in Table A and the individual analysis are found in Appendix VI. For each rock type the mean and standard deviations have been calculated for each of the various chemical and physical parameters. In general, the chemical content within a rock type is moderately consistent as shown by the sandstones and siltstones are variable due to sulfate enrichment by groundwater in some of these rock types and not others.
<table>
<thead>
<tr>
<th>Lithology</th>
<th>Number of Samples</th>
<th>Chemical Tests</th>
<th>Physical Tests</th>
<th>Physical Tests</th>
<th>Physical Tests</th>
<th>Physical Tests</th>
<th>CrushedRock</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackhawk Formation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandstone:</td>
<td>26</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loam</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>4.37 8.18 2.13 1.05 8874 11.47 609.6 0.06 8.0 1.55 21.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>3.91 5.13 1.08 0.69 6672 9.7 353.1 0.06 0.96 0.89 3.36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>Siltstone:</td>
<td>24</td>
<td>5</td>
<td></td>
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<td></td>
<td></td>
<td>Sandy</td>
<td>Loam</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>3.06 6.24 2.30 1.69 14512.88 38.26 466.41 0.18 7.88 1.41 20.81</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>2.63 7.23 2.78 3.72 8782.4 21.29 1222.63 0.16 1.08 1.72 1.82</td>
<td></td>
<td></td>
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<tr>
<td>Mudstone:</td>
<td>24</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loam</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>3.12 3.13 4.70 4.28 11074.13 70.31 233.96 0.12 8.0 1.10 23.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>2.36 2.89 12.76 12.58 5350.17 75.99 275.10 0.23 0.31 1.12 4.88</td>
<td></td>
<td></td>
<td></td>
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<td>Sandy</td>
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<td>Interbeds:</td>
<td>15</td>
<td>3</td>
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<td>Sandy</td>
<td>Loamy</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>4.34 7.98 2.79 1.30 10992.13 21.58 346.95 0.12 8.05 1.58 20.56</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
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<td>3.13 6.37 1.85 1.36 6584.59 9.97 359.46 0.11 0.23 0.92 1.33</td>
<td></td>
<td></td>
<td></td>
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<td>Sandy</td>
</tr>
<tr>
<td>Carbonate-mudstone:</td>
<td>25</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loamy</td>
</tr>
<tr>
<td>Mean</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
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<tr>
<td>Coal (Blind Canyon):</td>
<td>8</td>
<td>0</td>
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<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loamy</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>1.55 1.81 1.68 1.63 2089.38 10.19 103.88 0.12 8.0</td>
<td>0.36 60.66 0.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>0.59 2.88 1.35 1.27 2557.56 8.82 66.88 0.05 0.25</td>
<td>0.05 10.59 0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>Coal (Milawatha):</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loamy</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>1.52 2.85 1.41 1.58 2532.41 10.82 97.32 0.12 7.95 0.34 60.24 0.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>0.66 3.64 0.95 1.18 2738.02 8.41 72.14 0.21 0.24 0.07 16.84 0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
</tr>
<tr>
<td>Coal (Cottonwood):</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sandy</td>
<td>Loamy</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>2.50 3.3 0.47 2.21 465 55.0 321.0 0.96 0.43 7.40 1.40 21.86 0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Loamy</td>
</tr>
<tr>
<td>S.D.</td>
<td></td>
<td>0.25 0.37 0.37 0.37 2.21 2.21 2.21 0.34 2.34 2.34 2.34 2.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Loamy</td>
</tr>
</tbody>
</table>

| Sandstone:                | 11                | 4              |                |                |                |                | Sandy       | Loam    |
| Mean                      |                   | 5.14 8.58 3.42 3.57 3798 9.47 1457 0.11 6.76 2.49 30.46 |                |                |                |                |                | Sandy       | Loam    |
| S.D.                      |                   | 3.89 4.69 2.97 5.18 2965 6.98 2578 0.24 1.54 1.20 4.8 |                |                |                |                |                | Sandy       | Loam    |

1 SAR = Sodium Absorption Ratio
2 EC = Electrical Conductivity

NOTE: See Appendix VI for Raw Data
FIGURE 2.4
DATA LOCATION MAP

Part 2 - Environmental Resources

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2/5/2019
Cottonwood/Wilberg Mines

The sulfur content of the Hiawatha, Cottonwood, and Blind Canyon Seams averages 0.52%, and generally ranges from 0.49% to 0.59%. Of this sulfur content, 79% is in the form of organic sulfur and 16% is in the form of pyritic including marcasite. The remainder is in the form of sulfate.

Generally, the physical tests which were completed on these samples indicate that all rock types present have the tendency to resist reduction of grain size when excavated and reclaimed and only a minimum of clay-sized particles will be liberated. As may be expected, the coarser-grained rocks, sandstones and siltstones produced much less clay-sized particles when crushed. Generally, the dominant rock type in the area of the Cottonwood/Wilberg Mine is sandstone; therefore, any interpretations made should recognize this fact.

In addition to the aforementioned analyses that were made of the general overburden, the strata immediately above and below the coal seam were analyzed for their potential alkalinity and pyrite/marcasite content and the strata immediately below the coal was analyzed for clay content as well. The results of these tests are as follows:

(NOTE: See Appendix VI for Raw Data.)

<table>
<thead>
<tr>
<th>Zone Sampled</th>
<th># Samples</th>
<th>pH</th>
<th>% FeS Pyrite/Marcasite</th>
<th>% Clay</th>
<th>Potential Alkalinity Equivalent (mg/L CaCO3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiawatha Seam Roof</td>
<td>3</td>
<td>7.8</td>
<td>3.3</td>
<td>-</td>
<td>281,400</td>
</tr>
<tr>
<td>Hiawatha Seam Floor</td>
<td>3</td>
<td>7.5</td>
<td>1.3</td>
<td>5.5</td>
<td>127,300</td>
</tr>
<tr>
<td>Cottonwood Seam Roof</td>
<td>2</td>
<td>7.8</td>
<td>0.5</td>
<td>5.2</td>
<td>222,200</td>
</tr>
<tr>
<td>Cottonwood Seam Floor</td>
<td>1</td>
<td>8.7</td>
<td>0.4</td>
<td>10.5</td>
<td>70,200</td>
</tr>
<tr>
<td>Blind Canyon Seam Roof</td>
<td>2</td>
<td>8.1</td>
<td>0.5</td>
<td>-</td>
<td>252,600</td>
</tr>
<tr>
<td>Blind Canyon Seam Floor</td>
<td>3</td>
<td>8.3</td>
<td>1.3</td>
<td>9.0</td>
<td>3,500</td>
</tr>
</tbody>
</table>

The analyses of the overburden samples tested clearly show that no toxic or hazardous materials are present. The material excavated near the portal site is slightly alkaline. Generally, the soils in this region which are derived from the strata tested are alkaline as well. The overburden material which has been excavated will not degrade the quality of the soils in the area or of the groundwater percolating through this material.

Part 2 - Environmental Resources
The operator collected sample roof, floor and mid-seam material in active sections annually. A representative sample was taken in areas mined within a given year. The locations where the samples are taken were sufficient to include the various lithologies encountered during mining. The samples were analyzed for acid-and/or toxic-forming potential in accordance with the Divisions Guidelines for the Management of Topsoil and overburden. The laboratory analyses, including raw data, have been submitted to the Division annually.
Cottonwood/Wilberg Mine
Water Monitoring Program

For detailed information of the hydrology of the East Mountain CHIA,
refer to Volume 9, Hydrologic Section:
Cottonwood/Wilberg Mine, Deer Creek Mine
I. MONITORING LOCATIONS – WILBERG/COTTONWOOD MINE

A. Surface Water Hydrology (for maps refer to Deer Creek, Wilberg/Cottonwood Mine: Volume 9 Map HM-1B)

1. Cottonwood Creek Drainage System

   a. Grimes Wash (refer to Deer Creek and Wilberg/Cottonwood Mine: Volume 9 Map HM-1B)

      (1) GWR01 - Right Fork:
           (Approximately 1500 feet upstream of reclaimed drainage) 550 feet North, 1500 feet West of the Southwest corner of Section 22, Township 17 South, Range 7 East.

      (2) GWR02 - Left Fork:
           (Approximately 50 feet upstream of the reclaimed drainage) 200 feet South, 2350 feet East of the Northwest corner of Section 27, Township 17 South, Range 7 East.

      (3) GWR03 - Below the mine:
           (Approximately 500 feet downstream of reclaimed drainage) 1770 feet South, 1820 feet West of the Northeast corner of Section 27, Township 17 South, Range 7 East.

2. Reclamation Monitoring: Following final reclamation, backfilling and grading monitoring will be conducted at points immediately above and below the reclaimed site.

C. UPDES Monitoring Locations

   a. Wilberg/Cottonwood Mines
      UPDES UT0022896
         001- Mine Discharge @ Cottonwood Canyon (TMA)
II. MONITORING SCHEDULE (see enclosed monitoring schedules for operational, baseline, and reclamation monitoring)

A. Field Measurements

Field Measurements collected during quality sampling: Listed below are the sites which will be monitored by PacifiCorp - Energy West in accordance with the guidelines established by DOGM; i.e.

- Date and Time
- Flow
- pH
- Temperature
- Conductivity
- Dissolved oxygen (perennial streams only)

Surface Monitoring

Surface monitoring locations will be field monitored quarterly for all field parameters;

1. Cottonwood Canyon Creek
   a. Grimes Wash
      (1) GWR01
      (2) GWR02
      (3) GWR03

UPDES Monitoring

1. Wilberg/Cottonwood

UPDES site 001, will be monitored as specified in the individual permits.

Reclamation Monitoring

Surface Water Resources: (see enclosed summary of operational, baseline, and reclamation monitoring schedules)
Surface monitoring locations will be field monitored monthly for flow and all field parameters quarterly until bond release.

UPDES: Sites will be monitored as specified in the individual permits.
B. **Quality Sampling** (Laboratory Measurements)

1. **Surface Water Hydrology:** Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Quality (see Table 1-Surface Water Quality Parameter List). Quarterly sampling was initiated during March 1988 and will continue throughout the year; i.e., June, September, and December. Baseline analysis was performed in 2011 and will be repeated every five years there-after.

   a. **Cottonwood Creek Drainage**

      (1) Grimes Wash

         (a) GWR01
         (b) GWR02
         (c) GWR03

### Reclamation Monitoring - Surface Water Hydrology:

Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Quality (see Table 1-Surface Water Quality Parameter List). Sampling will be conducted on a quarterly basis until bond release. Baseline analysis will be performed on the 5th and 9th years following reclamation. In no case will baseline sampling time frame exceed 5 years converting from operational to reclamation monitoring.

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2. **UPDES Monitoring Sites**

   a. **Wilberg/Cottonwood Mines**

   UPDES site will be monitored as specified in the individual permits.
III. **ANNUAL REPORTS**

All hydrologic data collected regarding reclamation monitoring will be submitted to the Utah State Division of Oil, Gas and Mining on a quarterly basis.