Phase II and Phase III Bond Release Application

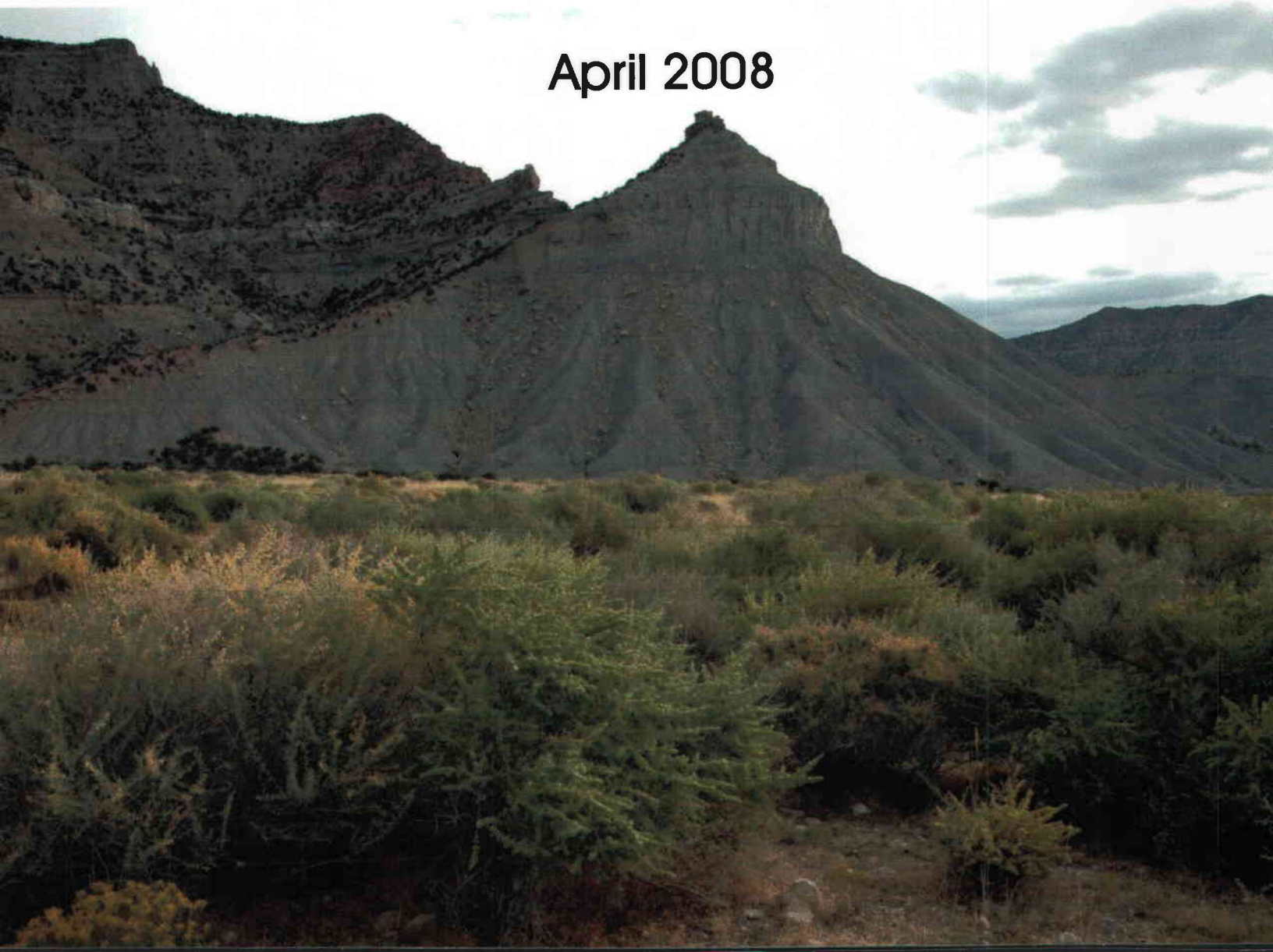
PacifiCorp

Energy West Mining Company

Cottonwood/Wilberg "Old" Waste Rock Site

C/015/0019

April 2008



Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 1
Notarized Signature

File in:
❑ Confidential
☒ Shelf
❑ Expandable
Refer to Record No. 0006 Date 04162008
In C/0150019, 2008, Incoming
For additional information

PacifiCorp
Energy West Mining Company
Cottonwood/Wilberg Mine
C/015/0019

Phase II and III Bond Release on Approximately 13.81 Acres of Land Related to the Cottonwood/Wilberg "Old" Waste Rock Site.

I hereby certify, to the best of my knowledge and belief, that all the information contained in this request is true and correct and that all applicable reclamation activities have been accomplished in accordance with the requirements of the Act, the regulatory program, and the approved reclamation plan.

KENNETH S. FLECK
Print Name

Kenneth S. Fleck 4/21/08
GEOLOGY & ENVIRONMENTAL AFFAIRS MANAGER
Signature, Position, Date

Subscribed and sworn to before me this 21st day of APRIL, 2008.

Notary Public

DON CHILDS
NOTARY PUBLIC • STATE of UTAH
31 NORTH MAIN STREET
HUNTINGTON, UT 84528
COMM. EXPIRES 11-23-2008

My Commission Expires: 11-23, 2008
Attest: State of UTAH
County of EMERY

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 2
Draft Letters to Interested Parties

March 31, 2008

[Interested Party]
Main Street
Anywhere, UT 84500

Attn: [Interested Party]

This letter is sent to inform you that Energy West Mining Company, a subsidiary of PacifiCorp, has filed an application for Phase II and III bond release of the Cottonwood/Wilberg "old" waste rock site (Permit Number C/015/0019) with the Division of Oil, Gas, and Mining. The said area is located within Township 17 South, Range 7 East, Section 34, NE1/4 SE1/4 and Section 35, E1/2 SW1/4, and is described as follows:

> Beginning at a point S 32°35'06" E, 582.18 feet from the east 1/4 corner of Township 17 South, Range 7 East, Section 34, SLB&M;
> Thence, S 32°35'06" E, 1296.31 feet;
> Thence, S 55°31'08" W, 411.69 feet;
> Thence, N 48°03'42" W, 656.18 feet;
> Thence, N 46°38'41" W, 472.77 feet;
> Thence, N 38°57'15" W, 229.19 feet;
> Thence, N 31°22'00" W, 90.38 feet;
> Thence, S 72°32'03" E, 65.63 feet;
> Thence, N 50°27'20" E, 295.51 feet;
> Thence, N 69°41'04" E, 398.55 feet, to the point of beginning.
>
> The southern area of lease U-37642 contains 18.45 acres, more or less.
> The waste rock site area, adjacent to the Wilberg Haul Road and within the above description, contains 15.62 acres of disturbed area, 13.81 acres of which is being applied for release.

The Cottonwood/Wilberg "old" waste rock site is located approximately 1.8 miles from the Cottonwood Mine and alongside the east side of Highway 57. This 48.62 acre site was initially originally designed as an open storage and truck loadout for the Cottonwood/Wilberg Mine. The Right of Way grant (UTU-37642) was issued by the Bureau of Land Management (BLM) in 1977. Subsequent developments at the mine site changed the need for this site. A use modification was submitted to the BLM to use this land for underground development waste storage in connection with the underground development ongoing in the Wilberg Mine and Des Bee Dove Mine. The waste containment area was developed in 1983 by excavating the first of seven cells. Enough material was stock piled for the construction of a berm around the cell. The berm not only provided containment of storm runoff waters up to and including the 10 year/24 hour event, it also provided backfilling and cover for each cell as reclamation was completed. Each cell was backfilled and graded according to the Mine Reclamation Plan. At the completion of each cell, the area was seeded with an approved seed mixture. Final backfilling and grading was completed in 1992-93 as cell seven reached its capacity.

In 1997, PacifiCorp and BLM worked to adjust the boundary of Lease UTU-37642 to accommodate coal bed methane degasification projects by Texaco Inc. This adjustment required the relinquishment of 1.08 acres of the lease for Texaco's well #35-14. The area consisted of the undisturbed area adjacent to and north of the rock and soil storage area. Texaco utilized this area as an access road through the lease to their well #35-14.

An application for Phase I bond release was submitted on December 17, 1998. The application included the majority of the disturbed area of the 20.83 acre southern parcel of Lease U-37642. The disturbed area within this lease parcel contains 15.62 acres of which include 1.81 acres for rock and soil storage. Total reclaimed area applied to the bond release application amounted to 13.81 acres. Phase I bond release was approved for this area on July 22, 1999.

In 1999, PacifiCorp and BLM again worked to adjust the boundary of Lease UTU-37642 to accommodate another coal bed methane degasification project by Texaco. This adjustment required the relinquishment of 12.98 acres of the lease for Texaco's well #34-80. The area consisted of mainly undisturbed acreage on the west side of State Highway 57. Texaco utilized this area as a utility corridor servicing the well. BLM approved the relinquishment of the 12.98 acres on November 2, 1999. Current total acreage of Lease UTU-37642 is 34.56 acres.

Since final reclamation in 1994, no mining activity has occurred at the Cottonwood/Wilberg "old" waste rock site. Monitoring of vegetation of each of the seven cells and berms has occurred nearly annually. In 2006, Mt. Nebo Scientific began monitoring for Phase III bond release. Sampling included two years collection of woody plant densities, productivity, cover, and species composition data. The data collected and analyzed by Mt. Nebo Scientific suggests that the area has met the requirements of the Utah Coal Regulations for bond release.

As required by the State of Utah, R645-Coal Mining Rules (R645-301-880), all adjoining property owners, local governmental bodies, etc, are notified, informing them of the operator's intention to seek release from bond. A public notice was published in the Emery County Progress commencing on [STARTING DATE] and will run for four (4) consecutive weeks.

If you have any questions, or require further information pertaining this bond release application, please feel free to call Dennis Oakley at (435) 687-4825.

Sincerely,

Dennis Oakley
Sr. Environmental Engineer

enclosure

cc Daron Haddock, w/encl (DOGM)
Scott Child, w/encl (IMC)
file, w/encl (EWMC)

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 3
Draft Newspaper Advertisement

COTTONWOOD/WILBERG MINE
Permit No. C/015/0019
Permit renewal: July 6, 2004

APPLICATION FOR BOND RELEASE

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits an application for Phase II and III bond release of the Cottonwood/Wilberg "old" waste rock site. This area consists of the southern portion of lease U-37642 which is located on the east side of Highway 57 (Wilberg Haul Road. The said area is located within Township 17 South, Range 7 East, Section 34, NE1/4 SE1/4 and Section 35, E1/2 SW1/4, and is described as follows:

> Beginning at a point S 32°35'06" E, 582.18 feet from the east 1/4 corner of Township 17 South, Range 7 East, Section 34, SLB&M;
> Thence, S 32°35'06" E, 1296.31 feet;
> Thence, S 55°31'08" W, 411.69 feet;
> Thence, N 48°03'42" W, 656.18 feet;
> Thence, N 46°38'41" W, 472.77 feet;
> Thence, N 38°57'15" W, 229.19 feet;
> Thence, N 31°22'00" W, 90.38 feet;
> Thence, S 72°32'03" E, 65.63 feet;
> Thence, N 50°27'20" E, 295.51 feet;
> Thence, N 69°41'04" E, 398.55 feet, to the point of beginning.
> The southern area of lease U-37642 contains 18.45 acres, more or less.
> The waste rock site area, adjacent to the Wilberg Haul Road and within the above description, contains 15.62 acres of disturbed area, 13.81 acres of which is being applied for release.

The waste rock site was first constructed in 1983 as a containment area for mine refuse from the Wilberg and Des Bee Dove mines. The site plan called for seven cells to be excavated. As each cell reached its capacity, they were reclaimed by back-filling and grading with stored soil material. Each cell was then revegetated with an approved seed mixture. Reclamation of the final cell was completed in 1992-1993.

A surety bond is posted with the Division of Oil, Gas and Mining for the Cottonwood/Wilberg Mine in the amount of $3,252,000.00. No reduction in the bond amount is being sought at this time. This notice is being published to comply with the Surface Mining Control and Reclamation Act of 1977, and State and Federal regulations promulgated pursuant to said Act.

Written comments may be submitted to: State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining, 1594 West North Temple, suite 1210, Box 145801, Salt Lake City, Utah 84114-5801. Said comments must be submitted within thirty (30) days from the date of the last publication of this notice.

Published in the Emery County Progress [STARTING DATE TO ENDING DATE].

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 4
Legal Description and Map

Legal Description for Phase II and III Bond Release

The area under application for release of the Cottonwood/Wilberg "old" waste rock site area consists of the southern portion of lease U-37642 in which Highway 57 (Wilberg Haul Road) borders. The said area is located within Township 17 South, Range 7 East, Section 34, NE1/4 SE1/4 and Section 35, E1/2 SW1/4, and is described as follows:

> Beginning at a point S 32°35'06" E, 582.18 feet from the east 1/4 corner of Township 17 South, Range 7 East, Section 34, SLB&M;
> Thence, S 32°35'06" E, 1296.31 feet;
> Thence, S 55°31'08" W, 411.69 feet;
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> Thence, N 31°22'00" W, 90.38 feet;
> Thence, S 72°32'03" E, 65.63 feet;
> Thence, N 50°27'20" E, 295.51 feet;
> Thence, N 69°41'04" E, 398.55 feet, to the point of beginning.
> The southern area of lease U-37642 contains 16.49 acres, more or less.
> The portion identified for release within waste rock site area, adjacent to the Wilberg Haul Road and within the above description, contains 13.81 acres of disturbance.

Refer to the attached drawing of the waste rock site.

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 5
Reclamation Treatments

Reclamation Treatments Utilized at the
Cottonwood/Wilberg "Old" Waste Rock Site: BLM ROW UTU-37642

Environment Conditions

The surrounding vegetation is a pinyon-juniper community. Important perennial understory species include curlleaf mountain mahogany, Cutler ephedra, black sagebrush, Harriman yucca, Indian ricegrass and bottlebrush squirreltail. Grasses are rare within this pinyon-juniper community.

The soil is a loamy-skeletal, mixed, mesic Xerollic Calciorthid and belongs to the Kenilworth series. These soils have a pH of approximately 7.7 and an exchangeable sodium content of 4 percent. Erosion potential is moderate. The soil is classified in Capability Unit VIIIs-SX (nonirrigated). Soils of this classification have severe limitations that restrict their use to primarily rangeland, woodland and wildlife habitat. The soils are limited by their shallow, droughty or stony conditions. Range improvement potential is limited by the presence of large boulders on the surface. The present range condition is fair.

Reclamation

Soil grading and revegetation of the cells and berms for the most part was accomplished during the construction of the individual cells. A total of seven cells were developed and final reclamation was completed in 1993. The berms and cells were revegetated by hand methods per Items 1 thru 6, refer to Final Revegetation Methods. Phase I bond release was approved by the Division on July 22, 1999.

The range site is a semi-desert stony loam (Pinyon-Juniper). Slopes vary from 3 to 5 percent. Annual precipitation is 8 to 12 inches with the majority being received during late summer. The frost-free season is 110 to 130 days. Elevation varies around 6800 feet. Present use of the area is rangeland. The post-mining use will also be rangeland.

A native plant mixture was selected that is adapted to the site. These species are perennial, drought resistant and fairly salinity resistant. Planting occurred after September 1 when soil, water and weather conditions are favorable. A grass, forb and shrub mixture was broadcast seeded at a rate of 19.2 pounds of pure live seed per acre. Fertilizer was applied per soil tests.

Immediately after seeding alfalfa hay was used to mulch the area at a rate of two tons per acre. The mulch was crimped into the soil.

Proper management is important following the revegetation process. Vehicle and foot traffic has been restricted from the area. Fencing the revegetated area prevented livestock grazing and keep unwanted traffic away. Rodent, rabbit and deer damage were monitored. Revegetation maintenance, monitoring, and sampling occurred nearly annually. Monitoring for Phase II and Phase III bond release occurred in September 2005 and 2006 respectively.

Final Revegetation Seed Mixture (Old Waste Rock Site)

Species		Planting Rate (PLS/acre)
GRASSES		
Western wheatgrass		2.0
Indian ricegrass		2.0
Needle-and-thread grass		2.0
Galleta		2.0
Crested wheatgrass		1.0
	Subtotal	9.0
FORBS		
Scarlet globemallow		1.0
Yellow sweet clover		1.0
	Subtotal	2.0
SHRUBS		
Four-wing Saltbush		2.0
Curlleaf Mountain Mahogany		2.0
Ephedra Mormon Tea		4.0
Vasey Big Sagebrush		0.2
	Subtotal	8.2
	TOTAL	**19.2**

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 6
General History of the Site

General History of Cottonwood/Wilberg "Old" Waste Rock Site

The Cottonwood/Wilberg "old" waste rock site is located approximately 1.8 miles from the Cottonwood/Wilberg Mine and alongside Highway 57. This 48.62 acre site was initially originally designed as an open storage and truck loadout for the Cottonwood/Wilberg Mine. The Right of Way grant (UTU-37642) was issued by the Bureau of Land Management (BLM) in 1977. Subsequent developments at the mine site changed the need for this site. A use modification was submitted to the BLM to use this land for underground development waste storage in connection with the underground development ongoing in the Wilberg Mine and Des Bee Dove Mine. The waste containment area was developed in 1983 by excavating the first of seven cells. Enough material was stock piled for the construction of a berm around the cell. The berm not only provided containment of storm runoff waters up to and including the 10 year/24 hour event, it also provided backfilling and cover for each cell as they were completed. Each cell was backfilled and graded according to the Mine Reclamation Plan, Volume 7, Appendix VII. At the completion of each cell, the area was seeded with an approved mixture as outlined in the Final Reclamation Plan, Volume II, Part 4, page 23. Final backfilling and grading was completed in 1992-93 as cell seven reached its capacity. The waste rock area, including the surrounding berms, consists of approximately 16 acres.

Vegetation monitoring of the site has been performed by Dr. Patrick Collins of Mt. Nebo Scientific Inc. and has been ongoing since 1983. During the mid – 1980's vegetative establishment was noted and a soils analysis was performed. Sampling was conducted initially in 1986. The analysis found possible concerns with Sodium Absorption Ratio (SAR), selenium and boron in cells 2, 4, and 5. Sampling of those problem cells was conducted again in 1989 and 1994. Cells 1, 3, and 6 were not resampled in 1994 since no quality problems were identified. A complete data review was conducted with the Phase I bond release submittal. It was determined that soil quality was improving over time through leaching processes.

In 1997, PacifiCorp and BLM worked to adjust the boundary of Lease UTU-37642 to accommodate coal bed methane degasification projects by Texaco Inc. This adjustment required the relinquishment of 1.08 acres of the lease for Texaco's well #35-14. The area consisted of the undisturbed area adjacent to and north of the rock and soil storage area. Texaco utilized this area as an access road through the lease to their well #35-14. BLM approved the relinquishment of the 1.08 acres on May 23, 1997.

An application for Phase I bond release was submitted on December 17, 1998. The application included the majority of the disturbed area of the 20.83 acre southern parcel of Lease U-37642. The disturbed area within this lease parcel contains 15.62 acres of which include 1.81 acres for rock and soil storage. Total reclaimed area applied to the bond release application amounted to 13.81 acres. Phase I bond release was approved for this area on July 22, 1999.

In 1999, PacifiCorp and BLM again worked to adjust the boundary of Lease UTU-37642 to accommodate another coal bed methane degasification project by Texaco. This adjustment required the relinquishment of 12.98 acres of the lease for Texaco's well #34-80. The area consisted of mainly undisturbed acreage on the west side of State Highway 57. Texaco utilized this area as a utility corridor servicing the well. The southern parcel was reduced from 20.83 acres to 18.45 acres. BLM approved the relinquishment of the 12.98 acres on November 2, 1999.

Since final reclamation in 1994, no mining activity has occurred at the Cottonwood/Wilberg waste rock site. Monitoring of vegetation of each of the seven cells and berms has occurred nearly annually. In 2005, Mt. Nebo Scientific began monitoring for Phase III bond release. Sampling included two years (2005 and 2006 field season) collection of woody plant densities, productivity, cover, and species composition data. This data can be reviewed in Attachment 8 of this document.

As part of the reclamation of the waste rock site, some structures will remain. Cell 3, an incised sediment basin, was constructed (not designed) to keep runoff from contacting the area of Cell 4 while this area was being filled with waste rock. This basin was never removed during reclamation activities. The basis is no longer used to collect runoff from Cell 3 and no diversions divert runoff into the basin. Vegetation has established nicely within and around the basin.

One other sediment control structure that remains is the berm that surrounds the east, west, and south sides of the waste rock site. The berm was constructed initially to keep intercepted rainfall from escaping the site. The berm is still functioning and retains runoff on-site. All precipitation that is intercepted on the site eventually infiltrates into the ground. The berm has very established vegetation and is described in the 2006 Vegetation Report in Attachment 8.

Structures remaining that still need removed are shown on the following page. These items include: fences, gates, signs, and vegetation monitoring enclosures. EnergyWest is currently in the process of removing these structures and intends to have them removed prior to approval of Phase III Bond Release processes. Most structures will be removed by hand. The fence will be removed with a rubber tired tractor or back-hoe in all accessible areas.

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 7
Current Total Bond Amount and Incremental Amount Requested for Release

Current Total Bond Amount and Incremental Amount Requested for Release

As presented in Volume 2 of the Cottonwood/Wilberg Mine MRP, Part 4, Appendix C, Bond Calculations, a surety bond is posted with the Division of Oil, Gas and Mining for the Cottonwood/Wilberg Mine in the amount of $3,252,000.00 (2012 dollars). The incremental bond amount for the Cottonwood/Wilberg Waste Rock Site is $504,148.00. This amount includes the reclamation of the new waste rock site on the west side of State Highway 57.

Because the costs were originally combined for both waste rock sites, no reduction in bond is being requested at this time. The bond summary is outlined below.

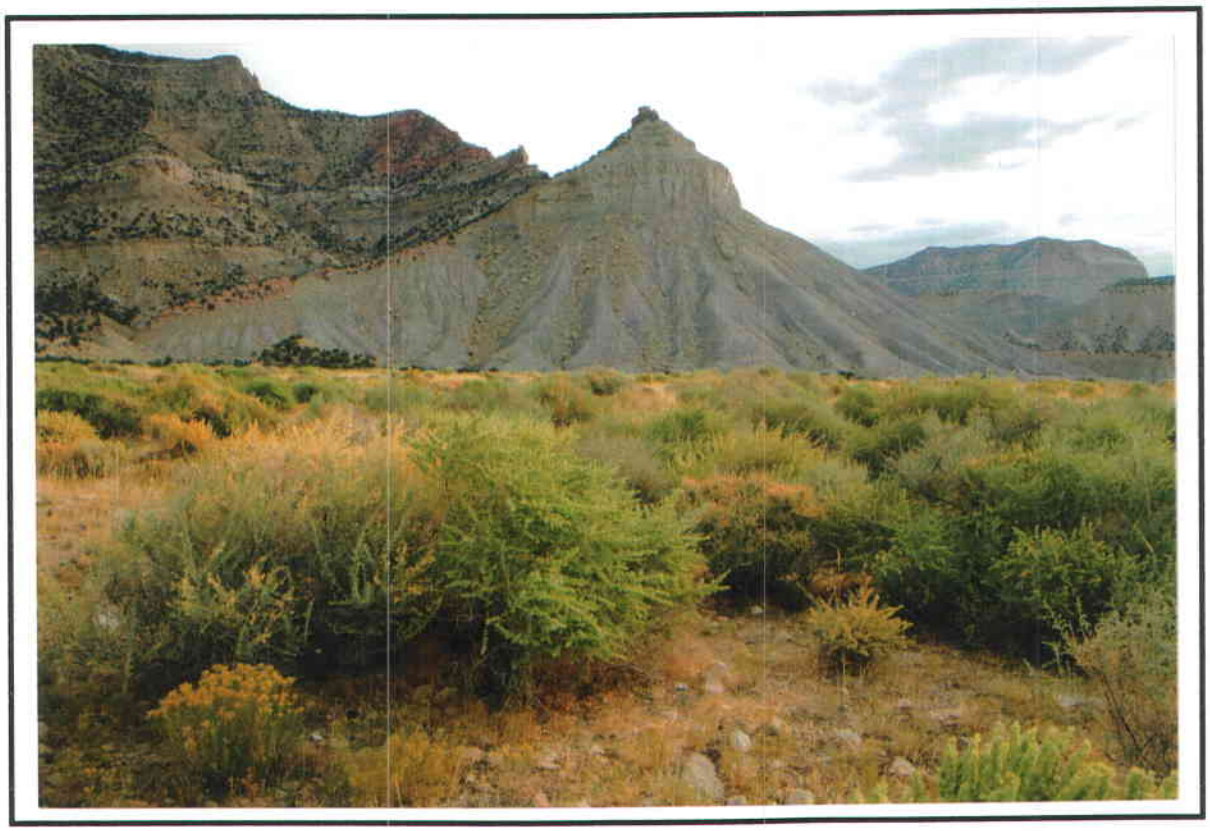
Direct Costs		
Grimes Wash Facility		
Demolition	$965,168.00	
Earthwork	$345,767.00	
Revegetation	$253,147.00	
Subtotal	$1,564,082.00	
Cottonwood Fan Portal		
Earthwork	$43,282.00	
Revegetation	$42,023.00	
Subtotal	$85,305.00	
Overland Conveyor		
Demolition	$22,178.00	
Earthwork	$7,057.00	
Revegetation	$8,403.00	
Subtotal	$37,638.00	
Cottonwood Waste Rock Site		
Demolition	$12,495.00	
Earthwork	$347,903.00	
Revegetation	$143,750.00	
Subtotal	$504,148.00	
Total Direct Costs	**$2,191,173.00**	
Indirect Costs		
Mob/Demob	$219,117.00	10.0%
Contingency	$109,559.00	5.0%
Engineering Redesign	$54,779.00	2.5%
Main Office Expense	$149,000.00	6.8%
Project Mainagement Fee	$54,779.00	2.5%
Total Indirect Costs	**$587,234.00**	26.8%
Total Cost (2007 Dollars)	**$2,778,407.00**	
Escalation factor		0.032
Number of years		5
Escalation	$473,921.00	
Reclamation Cost	$3,252,328.00	
Bond Amount (2012 Dollars)	**$3,252,000.00**	
(Rounded to nearest $1,000)		

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 8
Vegetation Analysis (2005/2006 Field Seasons)

VEGETATION MONITORING
FOR PHASE III BOND RELEASE
OLD WASTE ROCK SITE
YEAR ONE: 2005

COTTONWOOD MINE WASTE ROCK SITE



Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

Patrick D. Collins, Ph.D.

for

ENERGY WEST MINING COMPANY
P.O. Box 310
Huntington, Utah 84528

March 2006

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VEGETATION MONITORING FOR PHASE III BOND RELEASE OLD WASTE ROCK SITE

YEAR ONE: 2005

INTRODUCTION

In the past, several waste rock "cells" bounded by "berms" were constructed as disposal areas for waste rock products from the Cottonwood Mine. The total waste rock site is less than 15 acres in size. Since the time that the cells were constructed, they have been filled to the engineered capacity with the waste rock material created by coal mining operations. The waste material was then covered with topsoil or substitute topsoil and revegetated to a condition that should ultimately support the post-mining land use. In order to support the wildlife that exist on this reclaimed range land, specific vegetation standards have been set by designating a **reference area**, or an area previously chosen to be protected from unnatural disturbances that could represent vegetation standards for final revegetation success. The area designated as a reference area lies adjacent to the **Old Waste Rock Site**. The plant community supported on the reference area is Pinyon-Juniper, the same community that was disturbed to create the waste rock site for the mine. Because the reference area is located in such close proximity, other environmental variables were also similar to the reclaimed waste rock site (e.g. soils, elevation, exposure, precipitation, etc.).

Because the cells were filled to capacity at different times, reclamation also sometimes occurred at

different time periods. Or, because all cells and berms were *not* reseeded at the same time, completion of the operator's *Responsibility Period* for some cells and berms are different. The Responsibility Period is the specific time period required for vegetation establishment on reclaimed lands before the final bond release application can be submitted. This means that for some cells and berms, Phase III Bond Release applications could have been submitted before others. However, previous vegetation studies of the site suggested that it would be most prudent to attempt bond release for all cells and berms at the same time. Therefore, the first of the two consecutive years required to monitor the vegetation on reclaimed lands for Phase III Bond Release has been initiated with quantitative data recorded in 2005 and summarized in this report.

METHODS

Sample Areas

The following sites were sampled on the Cottonwood Mine Old Waste Rock Site:

Cell 1	Berm 1
Cell 2	Berm 2
Cell 3	Berm 3
Cell 4	Berm 4
Cell 5	
Cell 6	CTW Reference Area
Cell 7	

All field work to record cover, frequency, composition, and production for the reclaimed and reference areas was accomplished in August 2005. Woody species density measurements for the areas were recorded in September 2005. Data from each of the above areas were first summed

separately to identify differences between sites, but the mean combined totals of all areas were the values used for final bond release. The number of samples taken was a function of both the size of each area and employment sample adequacy formulas. In other words, in larger areas more samples were taken than the smaller areas, but the total number of samples were subject to the rigors of statistical sample adequacy.

Cover, Frequency and Composition

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

Woody Species Density

Density of woody plant species of the reclaimed and reference areas were recorded using a distance method called the point-quarter. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Production

Total annual biomass production was estimated by clipping, drying and weighing current annual growth in each sample quadrat. "Double sampling" using four quadrats were estimated around the clipped quadrat. Herbaceous and woody species production were recorded separately.

Diversity

There are several good methods to assess diversity in plant communities. Three diversity indices have been reported in this document for the reclaimed areas and the reference area. To begin, **MacArthur's Diversity Index** was calculated. This index is an effective diversity measurement and is computed using the equation $1/\sum pi^2$ (MacArthur and Wilson 1976, *The Theory of Island Biogeography,* Princeton: Princeton University Press). In this equation *pi* is the proportion of sum frequency contributed by the *i*th species in the sample area of concern. The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species. In other words, this index provides greater weight to those species that are present more often (with greater frequency) than those that are merely "present" in one or two quadrats. The **average number of species** per sample quadrat is another measure of species diversity provided from the data in this report. Finally, the *total number of species present* in the sample quadrats, or "**Richness**", was calculated for the sample areas.

Sample Sizes

Sample sizes for cover, woody species density and productivity of each area are given below.

Sample Sizes for Vegetation Monitoring in the Old Cottonwood Waste Rock Site (2005)			
Reclaimed Area			
	COVER	DENSITY	PRODUCTION
Cell 1	15	30	20
Cell 2	15	30	20
Cell 3	20	40	25
Cell 4	20	50	30
Cell 5	20	50	30
Cell 6	20	50	30
Cell 7	30	60	40
Berm 1	10	15	10
Berm 2	10	15	10
Berm 3	20	30	20
Berm 4	10	15	10
TOTAL	**190**	**385**	**245**
Reference Area			
	COVER	DENSITY	PRODUCTION
TOTAL	**140**	**90**	**200**

Sample Adequacy & Statistical Comparisons

As recommended by the State of Utah, Department of Natural Resources, Division of Oil, Gas &

Mining (DOGM) guidelines, sampling adequacy was calculated. The goal for the parameters of this study was 90% confidence level with a 10% change in mean (one-tailed t-value was used). The sample adequacy formula used is given below.

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

where,

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

Student's t-tests were employed to compare the reclaimed areas with the reference area for living cover, density and productivity. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to check or apply further statistical tests if desired.

Photographs

Color photographs of each cell, berm and the reference area were taken during the sample period and have been included with this report.

Raw Data

The raw cover, composition, and frequency data have been summarized on spreadsheets and have been included in the Appendix.

RESULTS

Reclaimed Areas

The mean total living cover for the cells and berms combined was 51.89% (Table 1-A). This living cover was comprised of 57.82% grasses, 37.21% shrubs, and 4.97% forbs (Table 1-B). A total of 21 plant species were present in the sample quadrats (Table 1-C).

The dominant plant species by cover and frequency were fourwing saltbush (*Atriplex canescens*), needle-and-thread grass (*Stipa comata*), cheatgrass (Bromus tectorum), crested wheatgrass (*Agropyron cristatum*), and broom snakeweed (*Gutierrezia sarothrae*). The cover and frequency values for each species present in the quadrats are shown in Table 2.

The mean total woody species density for the combined cells and berms was estimated at 4,382 individuals per acre (Table 3-A). The density in these areas were dominated by broom snakeweed and fourwing saltbush.

For production of the site, the total annual biomass was estimated at 1,938.85 pounds per acre, 804.40 of which was from the herbaceous component and 1,134.45 from woody plants (Table 3-B).

Reference Area

The total living cover (overstory plus understory) of the reference area, a pinyon-juniper plant community, was 30.16% (Table 4). The overstory and understory cover were nearly equally represented at 14.00% and 16.16%, respectively. The understory cover was comprised of 69.75% woody species, 29.54% forbs, and 0.71% grasses (Table 4-B). A total of 14 plant species were present in the sample quadrats (Table 4-C).

As depicted in the cover and frequency values of the reference area, the dominate plant species were pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). For a list of all species with their cover and frequency values, refer to Table 5.

Woody species density for the reference area was estimated at 799 plants per acre and was dominated by the same two species as in the cover measurements above, however, Mormon tea (*Ephedra viridis*) was also an important component here (Table 6-A).

Total annual biomass for the reference area was estimated at 355.47 pounds per acre, nearly all of it consisted of woody species (Table 6-B).

Comparisons Between Areas

Statistical analyses using Student's t-tests were employed to compare the total living cover,

woody species density and productivity of the reclaimed area with the reference area. These parameters are some of the most important subject fields in applying for Phase III Bond Release. For all of these parameters, the reclaimed areas (cells and berms) were significantly greater than the reference area (Table 7).

DISCUSSION

The tables referenced in the RESULTS section above provide a good summary of the quantitative sampling results for the reclaimed cells and berms as well as the reference area chosen for revegetation success standards. Statistical analyses have also been employed to compare the two areas with results strongly suggesting that the reclaimed areas have met specific revegetation standards. The summaries and statistical analyses have reported the data of the reclaimed areas (cells and berms combined) for total living cover, frequency, composition, woody species density, and annual productivity. To provide an even more clear assessment of the quantitative data at the Old Waste Rock Site, charts can graphically illustrate the values of each parameter on a site-by-site basis.

Total Living Cover

The mean combined total living cover of all cells, berms, and reference area have been discussed and compared previously in this report. To provide greater detail and to elaborate on this parameter, a graph comparing the cover of: 1) all cells individually, 2) all cells combined, and 3)

the reference area has been prepared (Fig. 1). As one can note by the graph, each cell exceeds the total living cover of the reference area.

Along this same premise, another graph (Fig. 2) compares the total living cover of: 1) each individual berm, 2) all berms combined, and 3) the reference area. The total living cover of each berm also exceeds that of the reference area.

Finally, Fig. 3 shows the mean of the all cells and berms compared to the reference area. This illustration shows the Phase III Bond Release parameters used in the statistical analyses reported in the RESULTS section of this report.

Woody Species Density

The same areas as explained above for the total living cover have been illustrated graphically for woody species densities. Consequently, Fig. 4 shows the densities for: 1) all cells individually, 2) all cells combined, and 3) the reference area. Again, each cell exceeds the woody species density of the reference area.

Fig. 5 presents the densities for: 1) each individual berm, 2) all berms combined, and 3) the reference area. The reclaimed berm densities also exceed those of the reference area.

Finally, Fig. 6 shows the densities of all cells and berms combined and compares this value to the

reference area, or an illustration that shows the parameters used in the statistical analyses employed in the RESULTS section of this report.

Biomass Production

Similarly, productivity has been compared graphically for each of the cells, berms and reference area. Fig. 7 shows the biomass production of: 1) each cell individually, 2) cells combined, and 4) the reference area.

Fig. 8 shows the same comparisons for each berm, combined berms, and reference area. In both cases, each cell or berm production estimate exceeds that of the reference area. Finally, the production of all cells and berms combined are compared with the reference area in Fig. 9.

Composition

Lifeform composition of the combined total living cover for the reclaimed areas and reference area was described and summarized in the tables of the RESULTS section in this report. Fig. 10 graphically illustrates the proportions of woody, forb and grass species for the reclaimed areas, whereas, Fig. 11 shows these proportions for the reference area.

Species Diversity

Three diversity indices have been used to compare the reclaimed areas with the reference area. They were the following: 1) the Average Number of Species per Quadrat, 2) MacArthur's Index, and 3) Richness. These indices are shown graphically in Fig. 12 and numerically in Fig. 13. The indices suggest that the reclaimed areas are more diverse than the reference area.

SUMMARY & CONCLUSIONS

The appropriate time period required for vegetation establishment on the reclaimed Old Waste Rock Site has passed. This means that an application for *final* or Phase III Bond Release can be submitted to the State of Utah. To receive Phase III Bond Release, the reestablished vegetation of the reclaimed land must meet specific state and federal requirements as specified by the State of Utah, Division of Oil, Gas & Mining. As dictated by the rules, vegetative cover must be "diverse, effective and permanent". Accordingly, there are specific requirements associated with cover, density, production and diversity of reclaimed lands.

Data summaries from quantitatively monitoring the reclaimed vegetation of the Cottonwood Mine Old Waste Rock Site along with those of a pinyon-juniper reference area, chosen to provide standards of revegetation success, have been submitted. More specifically, the total living cover, woody species density, and biomass productivity of the reclaimed areas have been statistically compared to the reference area. Additionally, lifeform composition and species frequencies have

been summarized for comparisons with the reference area. Finally, the data of individual cells and berms were separated and plotted to graphically compare the parameters of each site.

The Year 1 results of statistical analyses, quantitative data summaries, and illustrations for cover, density, frequency, composition, productivity and diversity provided in this report strongly suggest that the vegetation of the Cottonwood Mine Old Waste Rock Site meets or exceeds those revegetation success standards set by the pinyon-juniper reference area. If the Year 2 (2006) sampling results show the same outcome, an application for Phase III Bond Release by Energy West through the State of Utah would be warranted.

TABLE 1: Total cover (A), composition (B), and species present (C), summary for the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2005).

A.

TOTAL COVER	% MEAN COVER
Living Cover	**51.89**
Litter	12.62
Bareground	11.11
Rock	24.37
STANDARD DEVIATION (*s*)	14.69
SAMPLE SIZE (*n*)	190.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	21.69

B.

COMPOSITION	PERCENT COMPOSITION	STANDARD DEVIATION
Shrubs	37.21	30.43
Forbs	4.97	15.99
Grasses	57.82	32.47
SAMPLE SIZE (*n*)	190.00	

C.

SPECIES PRESENT

Agropyron cristatum
Artemisia tridentata
Atriplex canescens
Atriplex confertifolia
Bromus tectorum
Ceratoides lanata
Chrysothamnus nauseosus
Descurainia pinnata
Elymus cinereus
Elymus lanceolatus
Elymus smithii
Elymus spicatus
Ephedra viridis
Gutierrezia sarothrae
Halogeton glomeratus
Hilaria jamesii
Machaeranthera canescens
Malcomia africana
Sphaeralcea coccinea
Stipa comata
Stipa hymenoides

TABLE 2 : Cover and frequency values for each plant species in the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2005).

	MEAN	FREQUENCY
TREES & SHRUBS		
Artemisia tridentata	0.26	2.11
Atriplex confertifolia	0.13	0.53
Atriplex canescens	13.23	48.95
Ceratoides lanata	0.11	1.05
Chrysothamnus nauseosus	0.74	3.16
Ephedra viridis	0.28	3.68
Gutierrezia sarothrae	5.83	51.58
FORBS		
Descurainia pinnata	0.05	0.53
Halogeton glomeratus	0.32	2.63
Machaeranthera canescens	0.18	2.11
Malcomia africana	0.34	3.16
Sphaeralcea coccinea	0.18	0.53
GRASSES		
Agropyron cristatum	6.11	47.37
Bromus tectorum	6.88	41.05
Elymus lanceolatus	2.26	12.63
Elymus smithii	2.74	12.11
Elymus cinereus	0.08	1.05
Elymus spicatus	0.03	0.53
Hilaria jamesii	1.75	7.89
Stipa comata	9.95	53.68
Stipa hymenoides	0.45	2.63

SAMPLE SIZE (*n*) = 190.00

TABLE 3 : Woody species densities (A) and productivity (B) for the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2005).

A.

WOODY SPECIES DENSITY	NUMBER/ACRE
Artemisia tridentata	28.45
Atriplex corrugata	28.45
Atriplex confertifolia	14.23
Atriplex canescens	1658.75
Ceratoides lanata	79.67
Cercocarpus montanus	2.85
Chrysothamnus nauseosus	99.58
Chrysothamnus viscidiflorus	2.85
Ephedra viridis	204.85
Gutierrezia sarothrae	2261.93
MEAN TOTAL ($\bar{X}$)	4381.61
STANDARD DEVIATION (*s*)	3941.04
SAMPLE SIZE (*n*)	385.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	219.00

B.

PRODUCTION	POUNDS/ACRE
Herbaceous	804.40
Woody	1134.45
MEAN TOTAL ($\bar{X}$)	1938.85
STANDARD DEVIATION (*s*)	1225.31
SAMPLE SIZE (*n*)	245.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	108.80

TABLE 4: Total cover (A), composition (B), and species present (C), summary for the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2005).

A.

TOTAL COVER	% MEAN COVER
Overstory Cover	14.00
Understory Cover	16.16
Total Living Cover	**30.16**
Litter	29.19
Bareground	33.54
Rock	21.11
STANDARD DEVIATION (*s*)	20.94
SAMPLE SIZE (*n*)	140.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	130.00

B.

COMPOSITION	PERCENT COMPOSITION	STANDARD DEVIATION
Trees & Shrubs	69.75	43.29
Forbs	29.54	42.96
Grasses	0.71	8.42
SAMPLE SIZE (*n*)	140.00	

C.

SPECIES PRESENT

Cercocarpus montanus
Chenopodium sp.
Cryptantha sp.
Elymus salinus
Ephedra viridis
Eriogonum bicolor
Chamaesyce fendleri
Gutierrezia sarothrae
Juniperus osteosperma
Lepidium montanum
Opuntia polyacantha
Penstemon sp.
Pinus edulis
Yucca harrimaniae

TABLE 5 : Cover and frequency values for each plant species in the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2005).

	MEAN	FREQUENCY
OVERSTORY		
Juniperus osteosperma	7.00	22.14
Pinus edulis	7.00	25.71
TREES & SHRUBS		
Cercocarpus montanus	1.26	9.29
Ephedra viridis	2.10	12.14
Gutierrezia sarothrae	0.16	2.14
Juniperus osteosperma	2.53	18.57
Pinus edulis	7.82	42.14
Opuntia polyacantha	0.11	2.86
Yucca harrimaniae	0.11	2.14
FORBS		
Chamaesyce fendleri	0.41	15.00
Chenopodium sp.	0.31	4.29
Cryptantha flavoculata	0.21	6.43
Eriogonum bicolor	0.81	17.86
Lepidium montanum	0.08	2.86
Penstemon sp.	0.19	9.29
GRASSES		
Elymus salinus	0.07	0.71

SAMPLE SIZE (*n*) =140.00

TABLE 6: Woody species densities (A) and productivity (B) for the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2005).

A.

WOODY SPECIES DENSITY	NUMBER/ACRE
Cercocarpus montanus	66.59
Echinocereus whipplei	2.22
Ephedra viridis	184.25
Gutierrezia sarothrae	22.20
Juniperus osteosperma	166.49
Opuntia polyacantha	33.30
Pinus edulis	295.24
Yucca harrimaniae	28.86
MEAN TOTAL ($\bar{X}$)	799.14
STANDARD DEVIATION (*s*)	417.34
SAMPLE SIZE (*n*)	90.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	73.80

B.

PRODUCTION	POUNDS/ACRE
Herbaceous	7.22
Woody	328.25
MEAN TOTAL ($\bar{X}$)	335.47
STANDARD DEVIATION (*s*)	311.91
SAMPLE SIZE (*n*)	200.00
MINIMUM ADEQUATE SAMPLE (*nMIN*)	233.93

TABLE 7: Statistical summary sheet for the reclaimed cells and berms and the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2005).

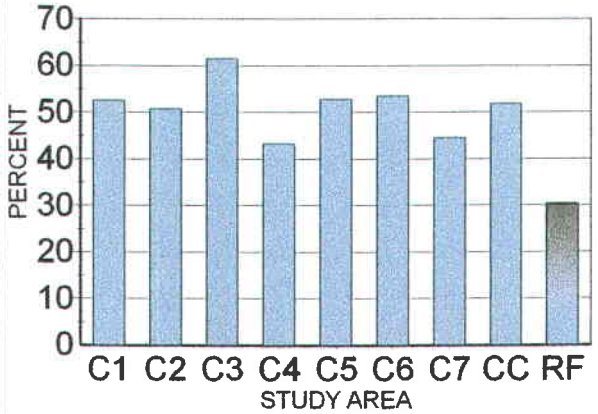
RECLAIMED AREAS			
Total Living Cover	$\bar{x}$=51.89	s=14.69	n=190
Density	$\bar{x}$=4381.61	s=3941.04	n=385
Productivity	$\bar{x}$=1938.85	s=1225.31	n=245
REFERENCE AREA			
Total Living Cover*	$\bar{x}$=30.16	s=20.94	n=140
Density	$\bar{x}$=799.14	s=417.34	n=90
Productivity	$\bar{x}$=335.47	s=311.91	n=200
STATISTICAL ANALYSES			
Total Living Cover	t=11.078	df=328	SL=p<.001
Density	t=8.606	df=473	SL=p<.001
Productivity	t=18.032	df=443	SL=p<.001

$\bar{x}$ = sample mean,
s = sample standard deviation,
n = sample size,
t = Student's t-value,
p=probability level
df = degrees of freedom,
SL = significance level,
* represents understory and overstory cover combined.

FIGURES

FIG. 1: LIVING COVER: CELLS & REFERENCE AREA

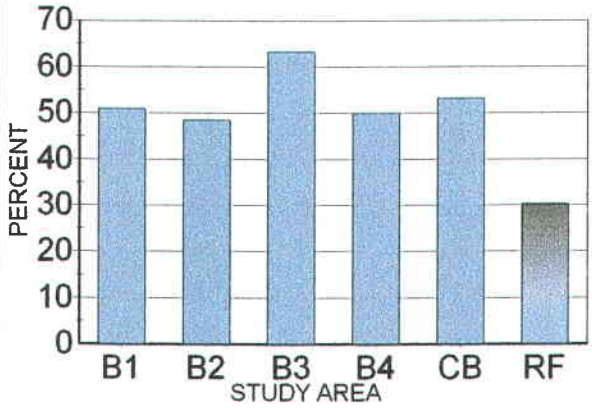
COTTONWOOD OLD WASTE ROCK SITE (2005)



C1=Cell 1; CC=Combined Cells; RF=Ref.Area

FIG. 2: COVER: BERMS AND REFERENCE AREA

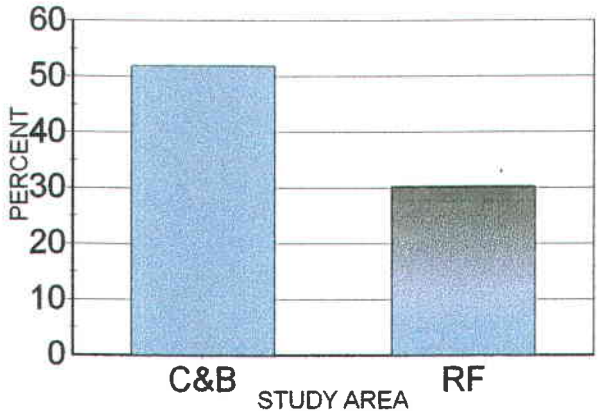
COTTONWOOD OLD WASTE ROCK SITE (2005)



B1=Berm 1; CB=Combined Berms; RF= Ref.Area

FIG. 3: LIVING COVER

COTTONWOOD OLD WASTE: ROCK SITE (2005)



C=Cells; B=Berms; RF=Ref.Area

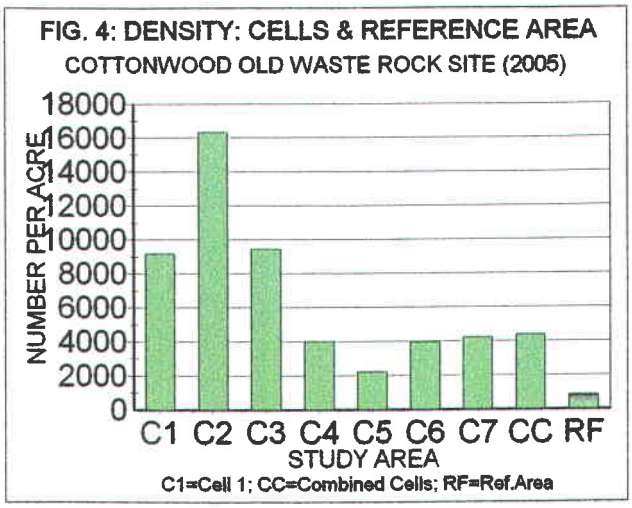


FIG. 4: DENSITY: CELLS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2005)
NUMBER PER ACRE
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
C1 C2 C3 C4 C5 C6 C7 CC RF
STUDY AREA
C1=Cell 1; CC=Combined Cells; RF=Ref.Area

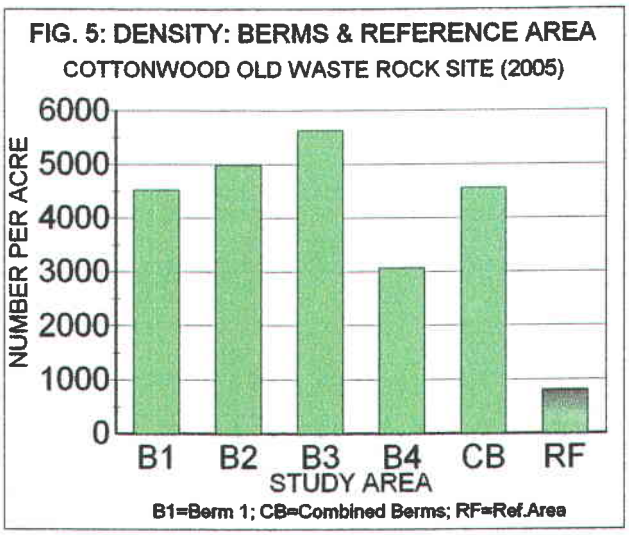


FIG. 5: DENSITY: BERMS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2005)
NUMBER PER ACRE
6000
5000
4000
3000
2000
1000
0
B1 B2 B3 B4 CB RF
STUDY AREA
B1=Berm 1; CB=Combined Berms; RF=Ref.Area

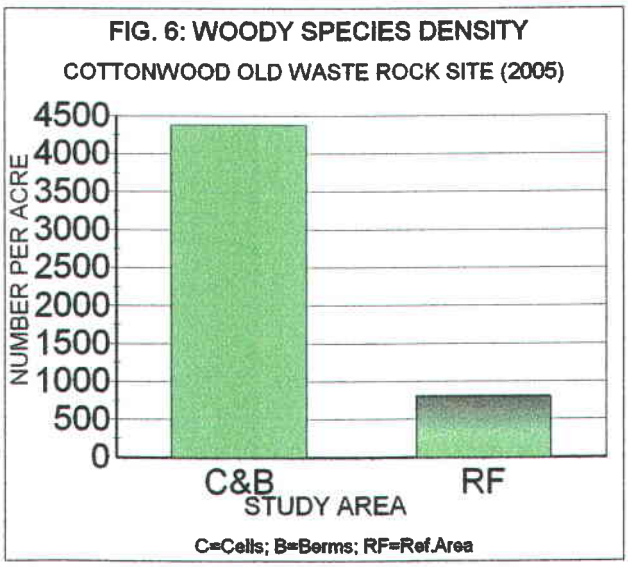
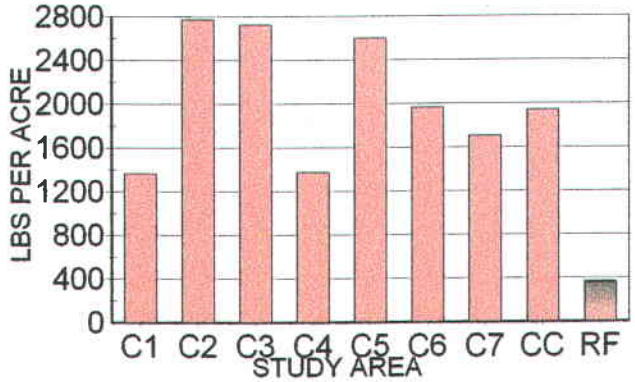


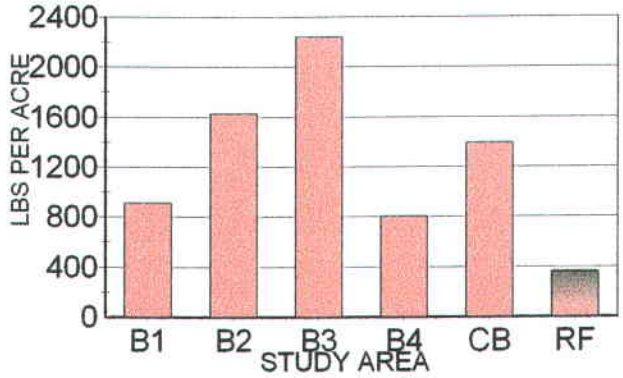
FIG. 6: WOODY SPECIES DENSITY
COTTONWOOD OLD WASTE ROCK SITE (2005)
NUMBER PER ACRE
4500
4000
3500
3000
2500
2000
1500
1000
500
0
C&B
RF
STUDY AREA
C=Cells; B=Berms; RF=Ref.Area

FIG. 7: PRODUCTION: CELLS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2005)



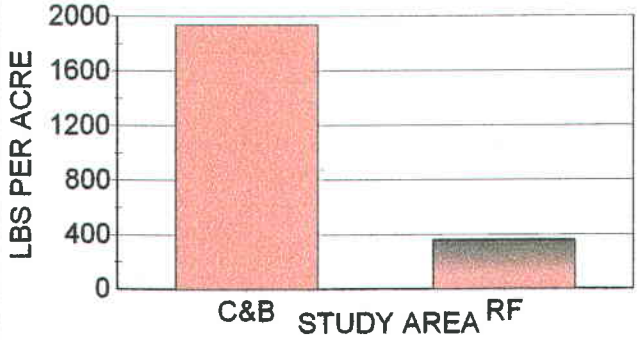
C1=Cell 1; CC=Combined Cells; RF=Ref.Area

FIG. 8: PRODUCTION: BERMS AND REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2005)



B1=Berm 1; CB=Combined Berms; RF=Ref.Area

FIG. 9: ANNUAL PRODUCTION
COTTONWOOD OLD WASTE ROCK SITE (2005)



C=Cells; B=Berms; RF=Ref.Area

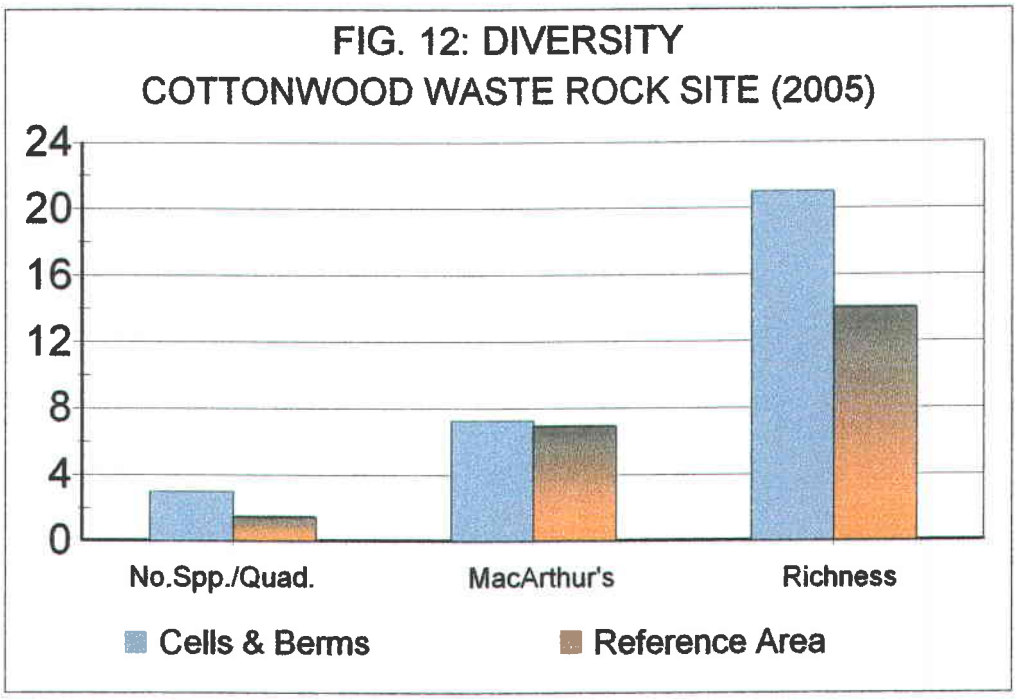


FIG. 12: DIVERSITY
COTTONWOOD WASTE ROCK SITE (2005)
24
20
16
12
8
4
0
No.Spp./Quad.
MacArthur's
Richness
Cells & Berms
Reference Area

FIG. 10: COMPOSITION - CELLS & BERMS COMBINED
Cottonwood Old Waste Rock Site (2005)

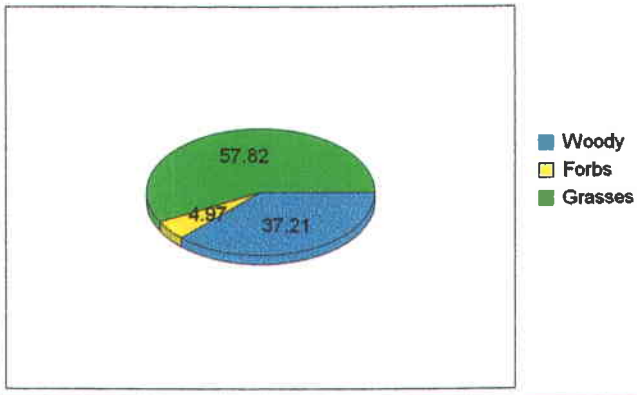


FIG. 11: COMPOSITION - REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2005)

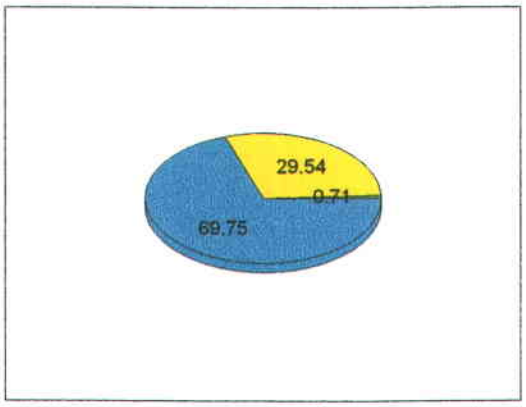


FIG. 13. Diversity at the Cottonwood Mine Old Waste Rock Site (2005)

A.
MacArthur's Index ($1/\sum p^2$) =
Reclaimed Cells & Berms: 7.269
Reference Area: 6.916

B.
Average No. Species/Quadrat =
Reclaimed Cells & Berms: 2.99
Reference Area: 1.460

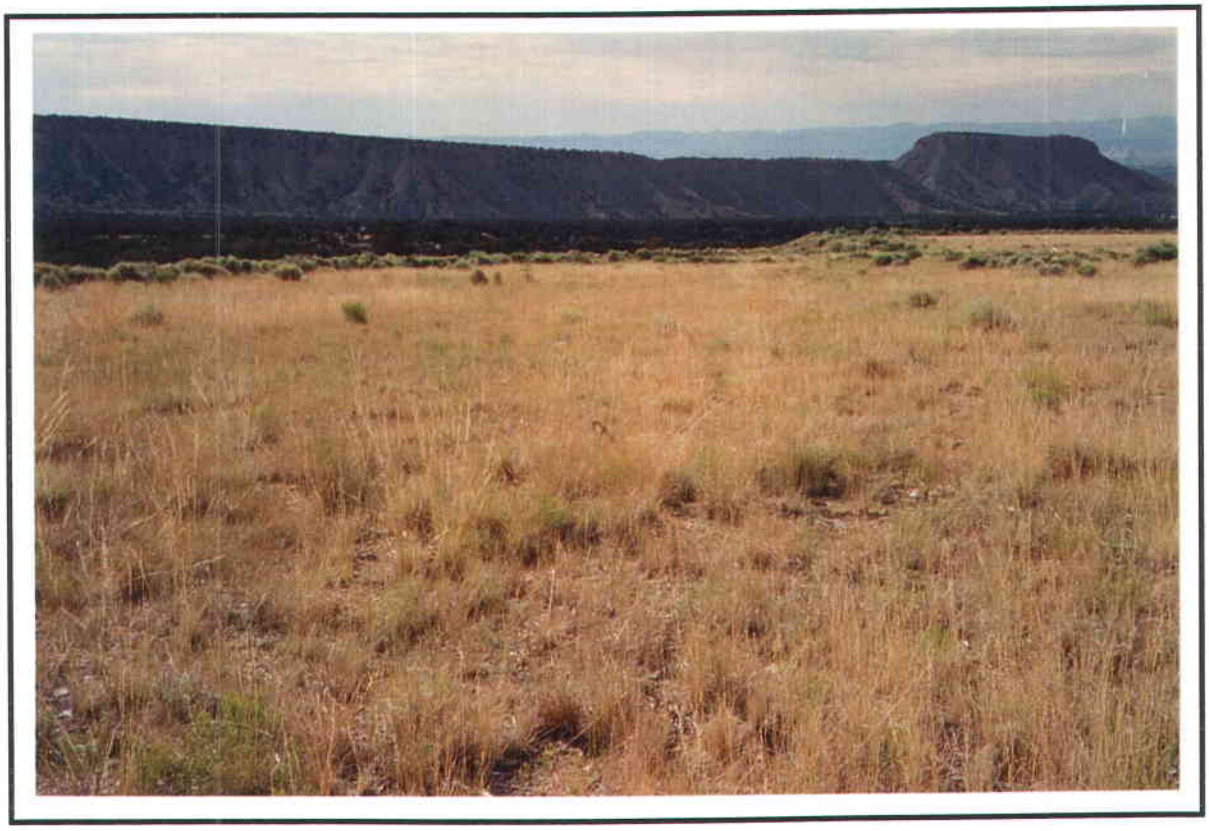
C.
Richness =
Reclaimed Cells & Berms: 21.0
Reference Area: 14.0

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS

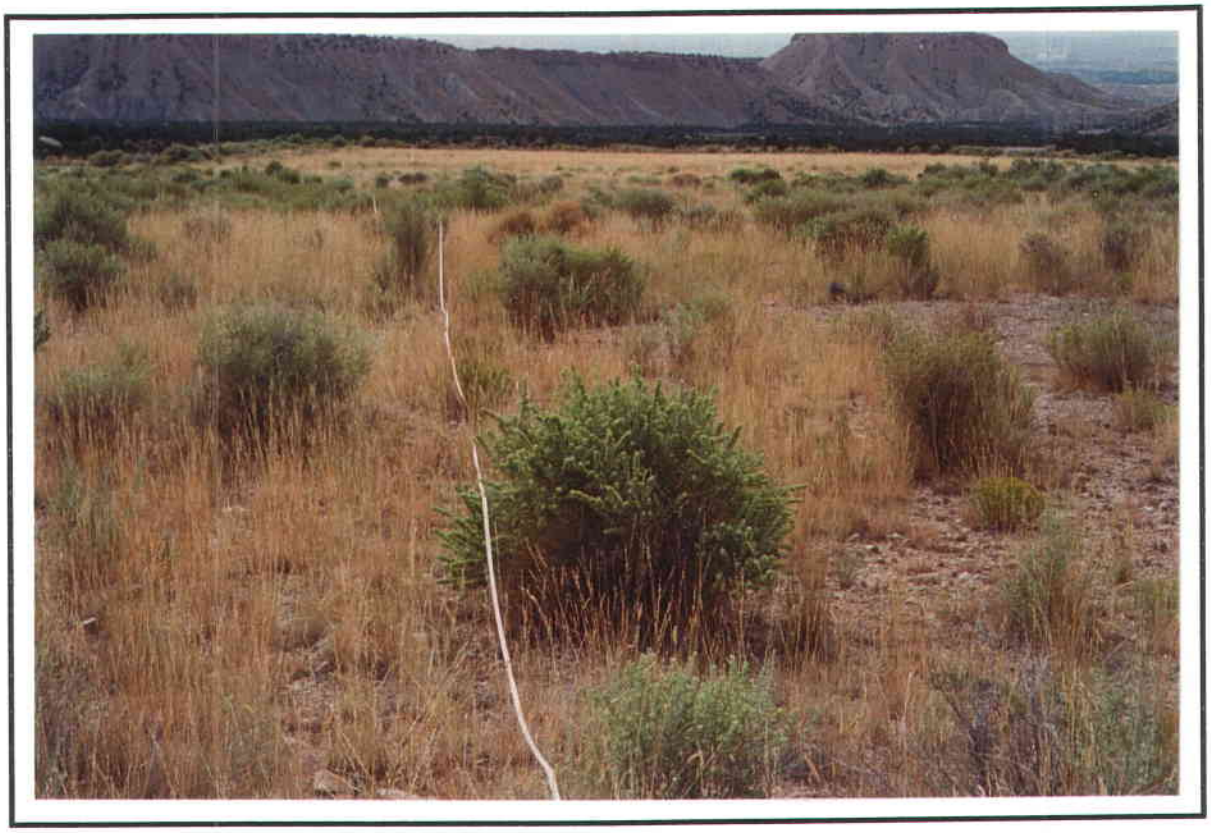
Cell 1

Cell 2

Cell 3



Cell 4



Cell 5

Cell 6

Cell 7

Berm 1

Berm 2

Berm 3 (1 of 2)

Berm 3 (2 of 2)

Berm 4

Pinyon-Juniper CTW Reference Area (1 of 2)

Pinyon-Juniper CTW Reference Area (2 of 2)

APPENDIX

Summarized Raw Data

ENERGY WEST MINING
Cells & Berms Combined Cell 1
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 0 -1 deg.

Sample Date: Aug 2005	1.00	2.00	3.00	4.00	5.00	6.00	7.00
TREES & SHRUBS							
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	20.00	0.00
Atriplex canescens	0.00	15.00	0.00	25.00	0.00	0.00	0.00
Atriplex confertifolia	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Ephedra viridis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	15.00	0.00	25.00	5.00	25.00	5.00	25.00
Ceratoides lanata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Descurainia pinnata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Malcomia africana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphaeralcea coccinea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Agropyron cristatum	10.00	5.00	5.00	0.00	0.00	10.00	0.00
Bromus tectorum	0.00	10.00	5.00	5.00	30.00	0.00	0.00
Elymus lanceolatus	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Elymus smithii	0.00	0.00	5.00	0.00	0.00	0.00	20.00
Stipa comata	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus cinereus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER							
Total Living Cover	50.00	35.00	40.00	35.00	60.00	35.00	45.00
Litter	15.00	15.00	10.00	10.00	5.00	10.00	8.00
Bareground	15.00	40.00	5.00	10.00	10.00	15.00	7.00
Rock	20.00	10.00	45.00	45.00	25.00	40.00	40.00
% COMPOSITION							
Shrubs	80.00	42.86	62.50	85.71	41.67	71.43	55.56
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	20.00	57.14	37.50	14.29	58.33	28.57	44.44

Cell 2

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	1.00	2.00
0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
0.00	0.00	35.00	30.00	40.00	20.00	10.00	15.00	20.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00
5.00	20.00	5.00	10.00	10.00	10.00	15.00	8.00	7.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	10.00	10.00	0.00	5.00	15.00	5.00	5.00
0.00	35.00	0.00	20.00	10.00	25.00	5.00	15.00	8.00	20.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	55.00	65.00	70.00	70.00	65.00	45.00	65.00	40.00	70.00
15.00	5.00	10.00	5.00	5.00	10.00	10.00	15.00	10.00	15.00
15.00	10.00	10.00	5.00	5.00	5.00	15.00	5.00	35.00	5.00
20.00	30.00	15.00	20.00	20.00	20.00	30.00	15.00	15.00	10.00
10.00	36.36	69.23	57.14	71.43	61.54	77.78	46.15	67.50	64.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90.00	63.64	30.77	42.86	28.57	38.46	22.22	53.85	32.50	35.71

3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	20.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	20.00	45.00	25.00	15.00	25.00	15.00	15.00	25.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	10.00	0.00	0.00	5.00	0.00	10.00
15.00	15.00	5.00	0.00	20.00	15.00	10.00	15.00	10.00	5.00
0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	15.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	45.00	60.00	25.00	70.00	50.00	30.00	50.00	40.00	45.00
15.00	10.00	10.00	5.00	5.00	10.00	10.00	15.00	10.00	10.00
5.00	10.00	10.00	55.00	5.00	20.00	40.00	10.00	40.00	15.00
30.00	35.00	20.00	15.00	20.00	20.00	20.00	25.00	10.00	30.00
50.00	66.67	75.00	100.00	50.00	70.00	50.00	30.00	62.50	11.11
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	33.33	25.00	0.00	50.00	30.00	50.00	70.00	37.50	88.89

Cell 3

13.00	14.00	15.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	35.00	0.00	0.00	15.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00
15.00	15.00	10.00	15.00	5.00	5.00	8.00	20.00	15.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	10.00	10.00	5.00	0.00	0.00	0.00	10.00	0.00	0.00
5.00	20.00	0.00	0.00	0.00	50.00	0.00	25.00	25.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00
0.00	0.00	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	5.00	25.00	5.00	5.00	10.00	15.00	5.00
0.00	0.00	5.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	70.00	70.00	35.00	40.00	75.00	70.00	65.00	70.00	70.00
45.00	5.00	5.00	15.00	15.00	5.00	5.00	10.00	10.00	5.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00
5.00	20.00	20.00	45.00	40.00	15.00	20.00	15.00	15.00	20.00
33.33	57.14	64.29	42.86	12.50	26.67	21.43	30.77	42.86	21.43
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66.67	42.86	35.71	57.14	87.50	73.33	78.57	69.23	57.14	78.57

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	50.00	30.00	15.00	45.00	35.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	5.00	15.00	20.00	0.00	5.00	5.00	15.00	10.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	15.00	15.00	10.00	15.00	0.00	0.00	5.00
5.00	0.00	20.00	0.00	0.00	25.00	15.00	10.00	35.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	0.00	10.00	10.00	5.00	15.00	35.00	15.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	75.00	65.00	60.00	70.00	80.00	65.00	60.00	75.00	65.00
10.00	5.00	25.00	25.00	10.00	5.00	5.00	15.00	10.00	15.00
5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
40.00	15.00	5.00	10.00	15.00	10.00	25.00	20.00	10.00	15.00
77.78	73.33	69.23	58.33	64.29	50.00	30.77	25.00	33.33	7.69
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.69
22.22	26.67	30.77	41.67	35.71	50.00	69.23	75.00	66.67	84.62

Cell 4

18.00	19.00	20.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	5.00	0.00	5.00	0.00	1.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	20.00	0.00	35.00	0.00	0.00
0.00	0.00	0.00	0.00	35.00	0.00	25.00	0.00	0.00	0.00
10.00	45.00	0.00	5.00	5.00	10.00	5.00	9.00	10.00	15.00
0.00	0.00	0.00	35.00	10.00	10.00	0.00	0.00	30.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
60.00	50.00	35.00	50.00	50.00	45.00	30.00	45.00	40.00	50.00
25.00	5.00	5.00	5.00	15.00	15.00	5.00	10.00	10.00	15.00
5.00	40.00	10.00	15.00	5.00	10.00	10.00	10.00	5.00	10.00
10.00	5.00	50.00	30.00	30.00	30.00	55.00	35.00	45.00	25.00
33.33	0.00	57.14	10.00	0.00	11.11	0.00	2.22	0.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66.67	100.00	42.86	90.00	100.00	88.89	100.00	97.78	100.00	50.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	20.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	10.00	0.00	7.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00
0.00	0.00	0.00	20.00	0.00	35.00	0.00	35.00	0.00	0.00
10.00	20.00	20.00	0.00	10.00	0.00	15.00	0.00	0.00	0.00
0.00	10.00	10.00	25.00	35.00	0.00	30.00	0.00	0.00	15.00
50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	40.00	35.00	55.00	60.00	35.00	55.00	35.00	35.00	35.00
10.00	5.00	15.00	25.00	20.00	10.00	15.00	10.00	30.00	10.00
10.00	5.00	5.00	10.00	5.00	20.00	10.00	10.00	5.00	30.00
15.00	50.00	45.00	10.00	15.00	35.00	20.00	45.00	30.00	25.00
7.69	0.00	14.29	18.18	16.67	0.00	0.00	0.00	57.14	14.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
92.31	100.00	85.71	81.82	83.33	100.00	100.00	100.00	42.86	85.71

Cell 5

18.00	19.00	20.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	15.00	15.00	5.00	0.00	10.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	5.00	5.00	10.00	10.00	5.00	2.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	10.00	0.00	0.00	10.00	0.00	8.00	10.00	5.00	10.00
0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	20.00
0.00	0.00	10.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	25.00	0.00	50.00	5.00	20.00	20.00	20.00	25.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	40.00	25.00	60.00	65.00	70.00	35.00	35.00	40.00	50.00
10.00	15.00	20.00	5.00	10.00	10.00	10.00	10.00	10.00	15.00
35.00	10.00	20.00	15.00	10.00	5.00	15.00	15.00	15.00	5.00
15.00	35.00	35.00	20.00	15.00	15.00	40.00	40.00	35.00	30.00
75.00	12.50	60.00	16.67	38.46	28.57	20.00	14.29	25.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	87.50	40.00	83.33	61.54	71.43	80.00	85.71	75.00	80.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	40.00	0.00	30.00	35.00	5.00	0.00	0.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	10.00	5.00	15.00	25.00	10.00	5.00	0.00
0.00	25.00	0.00	20.00	0.00	5.00	0.00	15.00	20.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	10.00	65.00	10.00	25.00	45.00	20.00	25.00	20.00	2.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	75.00	65.00	70.00	65.00	70.00	50.00	50.00	50.00	35.00
15.00	5.00	15.00	10.00	20.00	15.00	10.00	10.00	10.00	10.00
10.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00	10.00	10.00
25.00	15.00	15.00	10.00	10.00	10.00	35.00	35.00	30.00	45.00
0.00	53.33	0.00	42.86	53.85	7.14	10.00	0.00	10.00	71.43
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	46.67	100.00	57.14	46.15	92.86	90.00	100.00	90.00	28.57

Cell 6

18.00	19.00	20.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.00	5.00	0.00	15.00	0.00	0.00	15.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
5.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	0.00	20.00	15.00	0.00	0.00	5.00	5.00	0.00
0.00	5.00	5.00	5.00	15.00	35.00	50.00	25.00	40.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	30.00	5.00	10.00	10.00	15.00	0.00	10.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55.00	35.00	30.00	45.00	65.00	50.00	55.00	60.00	65.00	40.00
15.00	10.00	5.00	15.00	10.00	20.00	15.00	15.00	15.00	10.00
5.00	15.00	20.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00
25.00	40.00	45.00	35.00	20.00	25.00	25.00	15.00	15.00	45.00
54.55	0.00	16.67	22.22	38.46	0.00	0.00	33.33	23.08	0.00
0.00	0.00	0.00	0.00	0.00	0.00	9.09	0.00	0.00	50.00
45.45	100.00	83.33	77.78	61.54	100.00	90.91	66.67	76.92	50.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
10.00	5.00	35.00	5.00	15.00	0.00	5.00	0.00	25.00	55.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	10.00	10.00	0.00	0.00	5.00	10.00	2.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	20.00	0.00	0.00	65.00	10.00	0.00	10.00	10.00
55.00	45.00	15.00	25.00	5.00	0.00	20.00	0.00	10.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	15.00	10.00	0.00	10.00	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
70.00	70.00	70.00	55.00	45.00	65.00	45.00	40.00	65.00	75.00
10.00	5.00	10.00	20.00	20.00	15.00	5.00	20.00	15.00	5.00
5.00	10.00	15.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
15.00	15.00	5.00	20.00	30.00	15.00	45.00	35.00	15.00	15.00
21.43	7.14	50.00	27.27	55.56	0.00	11.11	62.50	69.23	76.00
0.00	7.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78.57	85.71	50.00	72.73	44.44	100.00	88.89	37.50	30.77	24.00

Cell 7

18.00	19.00	20.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	5.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	5.00	5.00	7.00	0.00	0.00	10.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	35.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00
0.00	0.00	5.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	25.00	20.00	35.00	35.00	35.00
0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	40.00	25.00	65.00	50.00	35.00	45.00	45.00	45.00	40.00
10.00	10.00	10.00	25.00	10.00	10.00	10.00	10.00	10.00	25.00
20.00	15.00	25.00	9.00	10.00	10.00	15.00	10.00	15.00	10.00
45.00	35.00	40.00	1.00	30.00	45.00	30.00	35.00	30.00	25.00
100.00	12.50	40.00	10.77	100.00	0.00	22.22	22.22	22.22	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	87.50	60.00	89.23	0.00	100.00	77.78	77.78	77.78	100.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
30.00	30.00	5.00	20.00	25.00	45.00	25.00	25.00	10.00	10.00
0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	30.00	20.00	45.00	45.00	50.00	35.00	30.00	40.00	45.00
30.00	15.00	5.00	15.00	25.00	20.00	25.00	30.00	25.00	10.00
5.00	15.00	20.00	10.00	10.00	10.00	10.00	10.00	5.00	10.00
35.00	40.00	55.00	30.00	20.00	20.00	30.00	30.00	30.00	35.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	16.67	0.00	55.56
0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	100.00	75.00	100.00	100.00	90.00	100.00	83.33	100.00	44.44

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	30.00	0.00	0.00	30.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	5.00	5.00	0.00	15.00	25.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	10.00
0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	25.00	55.00	10.00	40.00	40.00	20.00	20.00	35.00	25.00
25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	35.00	55.00	65.00	50.00	45.00	65.00	50.00	45.00	45.00
10.00	10.00	25.00	20.00	20.00	20.00	25.00	15.00	15.00	25.00
15.00	15.00	10.00	5.00	20.00	10.00	5.00	15.00	15.00	5.00
35.00	40.00	10.00	10.00	10.00	25.00	5.00	20.00	25.00	25.00
12.50	0.00	0.00	53.85	10.00	0.00	69.23	50.00	22.22	22.22
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
87.50	100.00	100.00	46.15	90.00	100.00	30.77	50.00	77.78	77.78

Berm 1

28.00	29.00	30.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	10.00	0.00	0.00	55.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	10.00	0.00	0.00	15.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	25.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	25.00	10.00	0.00	10.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	0.00	35.00	0.00	0.00	10.00	0.00	10.00	10.00
0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	20.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	30.00	75.00	65.00	45.00	35.00	45.00	35.00	75.00	50.00
10.00	5.00	15.00	10.00	5.00	5.00	5.00	5.00	10.00	10.00
15.00	25.00	5.00	15.00	25.00	10.00	10.00	15.00	10.00	15.00
35.00	40.00	5.00	10.00	25.00	50.00	40.00	45.00	5.00	25.00
12.50	16.67	13.33	0.00	33.33	71.43	0.00	71.43	86.67	70.00
0.00	0.00	0.00	46.15	66.67	28.57	0.00	28.57	0.00	10.00
87.50	83.33	86.67	53.85	0.00	0.00	100.00	0.00	13.33	20.00

Berm 2

8.00	9.00	10.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	0.00	45.00	5.00	25.00	25.00	20.00	10.00	50.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	25.00	35.00	25.00	10.00	20.00	25.00	10.00	0.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	25.00	70.00	40.00	50.00	40.00	40.00	35.00	70.00	25.00
15.00	5.00	5.00	15.00	10.00	10.00	10.00	10.00	5.00	5.00
5.00	20.00	15.00	10.00	20.00	20.00	20.00	10.00	10.00	10.00
15.00	50.00	10.00	35.00	20.00	30.00	30.00	45.00	15.00	60.00
46.15	0.00	64.29	12.50	50.00	75.00	50.00	28.57	78.57	60.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53.85	100.00	35.71	87.50	50.00	25.00	50.00	71.43	21.43	40.00

Berm 3

8.00	9.00	10.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	30.00	45.00	25.00	0.00	65.00	55.00	30.00	70.00	80.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	10.00	0.00	10.00	5.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	45.00	75.00	55.00	55.00	70.00	65.00	40.00	80.00	80.00
10.00	15.00	10.00	20.00	10.00	10.00	5.00	10.00	10.00	5.00
10.00	15.00	10.00	5.00	25.00	10.00	20.00	35.00	5.00	5.00
15.00	25.00	5.00	20.00	10.00	10.00	10.00	15.00	5.00	10.00
76.92	88.89	86.67	45.45	18.18	92.86	84.62	75.00	87.50	100.00
0.00	0.00	0.00	0.00	18.18	7.14	15.38	25.00	0.00	0.00
23.08	11.11	13.33	54.55	63.64	0.00	0.00	0.00	12.50	0.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	0.00	40.00	10.00	25.00	25.00	80.00	55.00	50.00	70.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	50.00	25.00	5.00	10.00	40.00	0.00	0.00	5.00	10.00
0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55.00	50.00	65.00	45.00	55.00	65.00	80.00	65.00	65.00	80.00
15.00	40.00	15.00	10.00	15.00	20.00	5.00	25.00	20.00	10.00
20.00	5.00	5.00	10.00	5.00	10.00	5.00	5.00	5.00	5.00
10.00	5.00	15.00	35.00	25.00	5.00	10.00	5.00	10.00	5.00
90.91	0.00	61.54	22.22	45.45	38.46	100.00	84.62	92.31	87.50
0.00	100.00	38.46	22.22	18.18	61.54	0.00	7.69	7.69	12.50
9.09	0.00	0.00	55.56	36.36	0.00	0.00	7.69	0.00	0.00

Berm 4

18.00	19.00	20.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.00	20.00	60.00	10.00	0.00	0.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	30.00	0.00	5.00	25.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	10.00	55.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	35.00	0.00	0.00	50.00	50.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80.00	35.00	80.00	70.00	40.00	50.00	35.00	50.00	50.00	65.00
5.00	5.00	5.00	15.00	15.00	15.00	5.00	10.00	15.00	20.00
5.00	45.00	5.00	5.00	10.00	15.00	15.00	10.00	5.00	5.00
10.00	15.00	10.00	10.00	35.00	20.00	45.00	30.00	30.00	10.00
100.00	57.14	75.00	14.29	0.00	30.00	42.86	50.00	0.00	0.00
0.00	0.00	0.00	7.14	100.00	0.00	14.29	50.00	0.00	23.08
0.00	42.86	25.00	78.57	0.00	70.00	42.86	0.00	100.00	76.92

ENERGY WEST MINING
Cell #1
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 0 -1 deg.
Sample Date: Aug 2005

8.00	9.00	10.00	Mean	SDev	Freq	
						TREES & SHRUBS
0.00	0.00	0.00	0.26	1.90	2.11	*Artemisia tridentata*
0.00	0.00	0.00	13.23	18.96	48.95	*Atriplex canescens*
0.00	0.00	0.00	0.13	1.81	0.53	*Atriplex confertifolia*
0.00	0.00	0.00	0.28	1.59	3.68	*Ephedra viridis*
0.00	0.00	0.00	5.83	7.97	51.58	*Gutierrezia sarothrae*
0.00	0.00	0.00	0.11	1.14	1.05	*Ceratoides lanata*
0.00	0.00	0.00	0.74	4.73	3.16	*Chrysothamnus nauseosus*
						FORBS
0.00	0.00	0.00	0.05	0.51	0.53	*Descurainia pinnata*
0.00	0.00	0.00	0.32	2.39	2.63	*Halogeton glomeratus*
5.00	0.00	0.00	0.18	1.19	2.11	*Machaeranthera canescens*
0.00	0.00	0.00	0.34	2.24	3.16	*Malcomia africana*
0.00	0.00	35.00	0.18	2.53	0.53	*Sphaeralcea coccinea*
						GRASSES
5.00	5.00	20.00	6.11	9.53	47.37	*Agropyron cristatum*
0.00	0.00	0.00	6.88	11.32	41.05	*Bromus tectorum*
0.00	0.00	0.00	2.26	7.87	12.63	*Elymus lanceolatus*
30.00	40.00	0.00	2.74	9.05	12.11	*Elymus smithii*
0.00	0.00	0.00	9.95	13.33	53.68	*Stipa comata*
0.00	0.00	0.00	1.75	7.13	7.89	*Hilaria jamesii*
0.00	0.00	0.00	0.03	0.36	0.53	*Elymus spicatus*
0.00	0.00	0.00	0.45	3.07	2.63	*Stipa hymenoides*
0.00	0.00	0.00	0.08	0.81	1.05	*Elymus cinereus*
						COVER
40.00	45.00	55.00	51.89	14.69		Total Living Cover
10.00	25.00	20.00	12.62	6.84		Litter
5.00	5.00	5.00	11.11	8.54		Bareground
45.00	25.00	20.00	24.37	13.07		Rock
						% COMPOSITION
0.00	0.00	0.00	37.21	30.43		Shrubs
25.00	11.11	100.00	4.97	15.99		Forbs
75.00	88.89	0.00	57.82	32.47		Grasses

ENERGY WEST MINING
Cell #1
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 0 -1 deg.
Sample Date: Aug 2005

No. Present in Quads n=190	
	TREES & SHRUBS
4.0	*Artemisia tridentata*
93.0	*Atriplex canescens*
1.0	*Atriplex confertifolia*
7.0	*Ephedra viridis*
98.0	*Gutierrezia sarothrae*
2.0	*Ceratoides lanata*
6.0	*Chrysothamnus nauseosus*
	FORBS
1.0	*Descurainia pinnata*
5.0	*Halogeton glomeratus*
4.0	*Machaeranthera canescens*
6.0	*Malcomia africana*
1.0	*Sphaeralcea coccinea*
	GRASSES
90.0	*Agropyron cristatum*
78.0	*Bromus tectorum*
24.0	*Elymus lanceolatus*
23.0	*Elymus smithii*
102.0	*Stipa comata*
15.0	*Hilaria jamesii*
1.0	*Elymus spicatus*
5.0	*Stipa hymenoides*
2.0	*Elymus cinereus*

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

ENERGY WEST MINING
CTW Reference Area
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 1 - 5 deg.

Sample Date: 8-10 Aug 2005	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
OVERSTORY								
Juniperus osteosperma	50.00	0.00	0.00	0.00	0.00	0.00	65.00	10.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY								
SHRUBS								
Cercocarpus montanus	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Ephedra viridis	0.00	0.00	0.00	0.00	25.00	40.00	0.00	1.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00
Opuntia polyacantha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	60.00	20.00	10.00	0.00	0.00	0.00
Yucca harrimaniae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS								
Chamaesyce fendleri	0.00	3.00	5.00	0.00	0.00	0.00	0.00	0.00
Chenopodium sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cryptantha sp.	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum bicolor	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
Lepidium montanum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES								
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER								
Overstory	50.00	0.00	0.00	0.00	0.00	0.00	65.00	10.00
Understory	5.00	6.00	65.00	35.00	35.00	40.00	1.00	1.00
Litter	30.00	5.00	15.00	15.00	15.00	40.00	20.00	35.00
Bareground	60.00	85.00	15.00	40.00	15.00	10.00	64.00	49.00
Rock	5.00	4.00	5.00	10.00	35.00	10.00	15.00	15.00
% COMPOSITION								
Shrubs	0.00	0.00	92.31	100.00	100.00	100.00	100.00	100.00
Forbs	100.00	100.00	7.69	0.00	0.00	0.00	0.00	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overstory + Understory	55.00	6.00	65.00	35.00	35.00	40.00	66.00	11.00

9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00
0.00	35.00	0.00	0.00	0.00	65.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	35.00	40.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
10.00	5.00	9.00	39.00	0.00	0.00	0.00	0.00	0.00	43.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	2.00	0.00
0.00	2.00	0.00	0.00	0.00	1.00	0.00	3.00	0.00	0.00	0.00
0.00	0.00	1.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	18.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	35.00	0.00	0.00	0.00	65.00	35.00	40.00	0.00	0.00	0.00
10.00	10.00	10.00	40.00	5.00	1.00	5.00	5.00	5.00	45.00	20.00
20.00	25.00	15.00	15.00	5.00	94.00	24.00	15.00	10.00	40.00	7.00
15.00	60.00	50.00	25.00	80.00	4.00	70.00	79.00	75.00	10.00	70.00
55.00	5.00	25.00	20.00	10.00	1.00	1.00	1.00	10.00	5.00	3.00
100.00	50.00	90.00	100.00	0.00	0.00	0.00	0.00	0.00	95.56	10.00
0.00	50.00	10.00	0.00	100.00	100.00	100.00	100.00	100.00	4.44	90.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	45.00	10.00	40.00	5.00	66.00	40.00	45.00	5.00	45.00	20.00

20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00
0.00	0.00	0.00	0.00	25.00	15.00	0.00	25.00	0.00	0.00	25.00
0.00	10.00	10.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00
45.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	30.00	8.00	0.00	0.00	10.00	19.00	7.00	0.00	0.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	40.00	0.00	0.00	0.00	8.00	8.00	20.00	0.00
0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	10.00	20.00	25.00	15.00	0.00	25.00	0.00	0.00	25.00
45.00	35.00	15.00	40.00	5.00	10.00	20.00	20.00	15.00	20.00	40.00
40.00	15.00	50.00	30.00	65.00	25.00	20.00	75.00	25.00	10.00	50.00
10.00	15.00	10.00	5.00	15.00	60.00	35.00	1.00	20.00	45.00	5.00
5.00	35.00	25.00	25.00	15.00	5.00	25.00	4.00	40.00	25.00	5.00
100.00	94.29	100.00	100.00	0.00	100.00	95.00	100.00	100.00	100.00	100.00
0.00	5.71	0.00	0.00	100.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	45.00	25.00	60.00	30.00	25.00	20.00	45.00	15.00	20.00	65.00

31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00	39.00	40.00	41.00
35.00	35.00	10.00	30.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	7.00	0.00	13.00	0.00	0	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00	0.00
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	2.00	5.00	0	0.00	0.00	0.00
4.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	35.00	10.00	30.00	65.00	0.00	0.00	0.00	65.00	0.00	0.00
25.00	1.00	1.00	7.00	5.00	15.00	5.00	7.00	3.00	10.00	5.00
30.00	69.00	20.00	23.00	90.00	10.00	30.00	20.00	94.00	25.00	10.00
40.00	25.00	70.00	10.00	4.00	55.00	50.00	70.00	1.00	60.00	65.00
5.00	5.00	9.00	60.00	1.00	20.00	15.00	3.00	2.00	5.00	20.00
80.00	0.00	100.00	100.00	0.00	86.67	0.00	100	0.00	100.00	100.00
20.00	100.00	0.00	0.00	100.00	13.33	100.00	0	100.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
60.00	36.00	11.00	37.00	70.00	15.00	5.00	7	68.00	10.00	5.00

42.00	43.00	44.00	45.00	46.00	47.00	48.00	49.00	50.00	51.00	52.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	40.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	25.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	2.00	30.00	25.00	15.00	25.00	35.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	40.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
12.00	25.00	35.00	30.00	25.00	15.00	25.00	35.00	25.00	20.00	30.00
5.00	10.00	20.00	10.00	15.00	20.00	15.00	60.00	15.00	20.00	15.00
13.00	10.00	5.00	10.00	15.00	40.00	10.00	4.00	30.00	50.00	45.00
70.00	55.00	40.00	50.00	45.00	25.00	50.00	1.00	30.00	10.00	10.00
83.33	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
16.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	35.00	35.00	70.00	25.00	30.00	25.00	35.00	25.00	20.00	30.00

53.00	54.00	55.00	56.00	57.00	58.00	59.00	60.00	61.00	62.00	63.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	15.00	0.00	30.00	5.00	0.00	25.00	50.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	15.00	70.00	0.00	0.00	20.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	0.00	0.00	4.00	0.00	5.00	0.00	0.00	5.00	2.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	15.00	0.00	30.00	5.00	0.00	25.00	50.00	0.00	0.00	0.00
10.00	5.00	5.00	20.00	70.00	5.00	1.00	20.00	5.00	5.00	5.00
85.00	35.00	15.00	25.00	25.00	25.00	85.00	75.00	5.00	5.00	5.00
1.00	50.00	65.00	15.00	4.00	50.00	4.00	4.00	20.00	65.00	60.00
4.00	10.00	15.00	40.00	1.00	20.00	10.00	1.00	70.00	25.00	30.00
90.00	100.00	0.00	75.00	100.00	0.00	0.00	100.00	0.00	0.00	100.00
10.00	0.00	100.00	25.00	0.00	100.00	100.00	0.00	100.00	100.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	20.00	5.00	50.00	75.00	5.00	26.00	70.00	5.00	5.00	5.00

64.00	65.00	66.00	67.00	68.00	69.00	70.00	71.00	72.00	73.00	74.00
0.00	0.00	0.00	45.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
0.00	15.00	0.00	0.00	0.00	35.00	25.00	50.00	0.00	0.00	0.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	35.00	0.00	0.00	15.00	0.00	20.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	45.00	0.00	35.00	25.00	50.00	0.00	15.00	0.00
50.00	1.00	35.00	5.00	5.00	15.00	7.00	20.00	5.00	5.00	5.00
5.00	50.00	35.00	20.00	10.00	70.00	5.00	70.00	45.00	15.00	20.00
35.00	45.00	20.00	60.00	20.00	5.00	3.00	5.00	25.00	20.00	60.00
10.00	4.00	10.00	15.00	65.00	10.00	85.00	5.00	25.00	60.00	15.00
100.00	0.00	100.00	100.00	0.00	100.00	100.00	100.00	0.00	100.00	80.00
0.00	100.00	0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	16.00	35.00	50.00	5.00	50.00	32.00	70.00	5.00	20.00	5.00

75.00	76.00	77.00	78.00	79.00	80.00	81.00	82.00	83.00	84.00	85.00
0.00	0.00	0.00	0.00	0.00	40.00	40.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	7.00	0.00	0.00	0.00	0.00	10.00	0.00	40.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	20.00	0.00	10.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	1.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	40.00	40.00	0.00	0.00	0.00	0.00
5.00	15.00	40.00	5.00	20.00	10.00	30.00	7.00	50.00	35.00	10.00
15.00	20.00	10.00	20.00	15.00	50.00	60.00	20.00	15.00	20.00	65.00
20.00	45.00	30.00	60.00	55.00	35.00	9.00	60.00	25.00	35.00	20.00
60.00	20.00	20.00	15.00	10.00	5.00	1.00	13.00	10.00	10.00	5.00
0.00	80.00	100.00	80.00	100.00	100.00	100.00	0.00	100.00	100.00	0.00
100.00	20.00	0.00	20.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
5.00	15.00	40.00	5.00	20.00	50.00	70.00	7.00	50.00	35.00	10.00

86.00	87.00	88.00	89.00	90.00	91.00	92.00	93.00	94.00	95.00	96.00
0.00	20.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	10.00	20.00
35.00	20.00	5	0.00	0.00	25.00	0.00	0.00	30.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	5	0.00	15.00	1.00	0.00	20.00	20.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	40.00	5.00	0.00	0.00	25.00	50.00	0.00	30.00	10.00	20.00
5.00	15.00	5.00	5.00	30.00	1.00	15.00	25.00	20.00	10.00	5.00
85.00	20.00	30.00	25.00	25.00	45.00	20.00	5.00	25.00	20.00	10.00
5.00	40.00	45.00	45.00	25.00	19.00	40.00	5.00	10.00	25.00	40.00
5.00	25.00	20.00	25.00	20.00	35.00	25.00	65.00	45.00	45.00	45.00
0.00	100.00	100.00	0.00	100.00	100.00	100.00	80.00	100.00	100.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	20.00	0.00	0.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	55.00	10.00	5.00	30.00	26.00	65.00	25.00	50.00	20.00	25.00

97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	10.00	0.00	0.00	33.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	3.00	1.00	5.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	35.00
5.00	15.00	10.00	30.00	7.00	35.00	5.00	5.00	10.00	35.00	10.00
10.00	25.00	25.00	10.00	3.00	25.00	15.00	15.00	25.00	55.00	70.00
50.00	25.00	20.00	15.00	80.00	30.00	45.00	35.00	30.00	5.00	15.00
35.00	35.00	45.00	45.00	10.00	10.00	35.00	45.00	35.00	5.00	5.00
100.00	100.00	100.00	100.00	57.14	94.29	0.00	0.00	100.00	100.00	0.00
0.00	0.00	0.00	0.00	42.86	5.71	100.00	100.00	0.00	0.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	15.00	10.00	30.00	7.00	35.00	5.00	5.00	10.00	70.00	45.00

108.00	109.00	110.00	111.00	112.00	113.00	114.00	115.00	116.00	117.00	118.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00
60.00	30.00	5.00	0.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00
0.00	7.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00
0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	8.00	0.00	0.00	5.00	0.00	65.00	3.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	2.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	3.00	0.00	1.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	30.00	5.00	0.00	0.00	0.00	40.00	25.00	0.00	0.00	0.00
5.00	15.00	5.00	10.00	5.00	5.00	5.00	5.00	65.00	5.00	7.00
85.00	75.00	5.00	5.00	10.00	15.00	85.00	25.00	10.00	25.00	18.00
5.00	5.00	50.00	45.00	35.00	50.00	5.00	50.00	10.00	50.00	35.00
5.00	5.00	40.00	40.00	50.00	30.00	5.00	20.00	15.00	20.00	40.00
100.00	100.00	0.00	80.00	0.00	0.00	100.00	80.00	100.00	60.00	100.00
0.00	0.00	100.00	20.00	100.00	100.00	0.00	20.00	0.00	40.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	45.00	10.00	10.00	5.00	5.00	45.00	30.00	65.00	5.00	7.00

119.00	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00	128.00	129.00
45.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	5.00	0.00
0.00	5.00	0.00	0.00	0.00	20.00	10.00	0.00	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	17.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	30.00	0.00	0.00	0.00	20.00	10.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	5.00	0.00	0.00	0.00	20.00	20.00	0.00	15.00	5.00	0.00
5.00	20.00	30.00	10.00	10.00	20.00	20.00	10.00	1.00	20.00	5.00
90.00	25.00	25.00	25.00	25.00	5.00	15.00	10.00	15.00	35.00	20.00
4.00	50.00	35.00	60.00	60.00	70.00	55.00	55.00	55.00	25.00	50.00
1.00	5.00	10.00	5.00	5.00	5.00	10.00	25.00	29.00	20.00	25.00
100.00	100.00	100.00	90.00	100.00	0.00	100.00	100.00	0.00	85.00	0.00
0.00	0.00	0.00	10.00	0.00	100.00	0.00	0.00	100.00	15.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	25.00	30.00	10.00	10.00	40.00	40.00	10.00	16.00	25.00	5.00

130.00	131.00	132.00	133.00	134.00	135.00	136.00	137.00	138.00	139.00	140.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	60	0.00	0.00
0.00	50.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	40.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	0.00	0.00	14.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	25.00	10.00	0.00	0.00	0.00	10.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	50.00	0.00	0.00	0.00	20.00	0.00	35.00	60.00	40.00	15.00
15.00	10.00	20.00	10.00	25.00	10.00	25.00	10.00	5.00	20.00	25.00
10.00	40.00	25.00	25.00	30.00	55.00	20.00	10.00	20.00	30.00	70.00
25.00	5.00	40.00	40.00	40.00	25.00	20.00	65.00	70.00	45.00	3.00
50.00	45.00	15.00	25.00	5.00	10.00	35.00	15.00	5.00	5.00	2.00
0.00	100.00	100.00	100.00	100.00	100.00	56.00	0.00	100.00	100.00	100.00
100.00	0.00	0.00	0.00	0.00	0.00	44.00	100.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	60.00	20.00	10.00	25.00	30.00	25.00	45.00	65.00	60.00	40.00

ENERGY WEST MINING
CTW Reference Area
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 1 - 5 deg.
Sample Date: 8-10 Aug 2005

Mean	SDev	Freq		No. Present in Quads n=140
			OVERSTORY	
7.00	15.60	22.14	*Juniperus osteosperma*	31.0
7.00	14.62	25.71	*Pinus edulis*	36.0
			UNDERSTORY	
			SHRUBS	
1.26	5.45	9.29	*Cercocarpus montanus*	13.0
2.10	7.34	12.14	*Ephedra viridis*	17.0
0.16	1.10	2.14	*Gutierrezia sarothrae*	3.0
2.53	6.65	18.57	*Juniperus osteosperma*	26.0
0.11	0.65	2.86	*Opuntia polyacantha*	4.0
7.82	13.34	42.14	*Pinus edulis*	59.0
0.11	0.76	2.14	*Yucca harrimaniae*	3.0
			FORBS	
0.41	1.12	15.00	*Chamaesyce fendleri*	21.0
0.31	1.95	4.29	*Chenopodium sp.*	6.0
0.21	0.90	6.43	*Cryptantha sp.*	9.0
0.81	2.32	17.86	*Eriogonum bicolor*	25.0
0.08	0.55	2.86	*Lepidium montanum*	4.0
0.19	0.75	9.29	*Penstemon sp.*	13.0
			GRASSES	
0.07	0.84	0.71	*Elymus salinus*	1.0

			COVER
14.00	19.14		Overstory
16.16	14.20		Understory
29.19	23.17		Litter
33.54	22.66		Bareground
21.11	18.43		Rock
			% COMPOSITION
69.75	43.29		Shrubs
29.54	42.96		Forbs
0.71	8.42		Grasses
30.16	20.94		Overstory + Understory

VEGETATION MONITORING
FOR PHASE III BOND RELEASE
OLD WASTE ROCK SITE
YEAR TWO: 2006

COTTONWOOD MINE WASTE ROCK SITE

Prepared by

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March 2007

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VEGETATION MONITORING
FOR PHASE III BOND RELEASE
OLD WASTE ROCK SITE
YEAR TWO: 2006

COTTONWOOD MINE WASTE ROCK SITE

INTRODUCTION

This report is the second of two consecutive years required of vegetation sampling following the "responsibility period" to show revegetation success of an area that has been reclaimed by Energy West Mining Company. As required by state and federal regulations, vegetation parameters must be compared to the success standards that are dictated in the mining permit. In order to support grazing and wildlife that exist on this reclaimed range land, specific vegetation standards were set by designating a *reference area*, or an area previously chosen to be protected from unnatural disturbances so it could represent standards for final revegetation success. The reference area lies adjacent to the Old Waste Rock Site. The plant community supported within the reference area is pinyon-juniper, the same community that was disturbed to create the waste rock site for the mine. Because the reference area is located in such close proximity, other environmental variables were also similar to the reclaimed waste rock site (e.g. soils, elevation, exposure, precipitation, etc.).

The reclaimed site was first constructed of several waste "cells" that were bound by "berms". The site was created several years ago as a disposal site for waste rock products from the

Cottonwood Mine. The total waste rock site is less than 15 acres in size. Since the time that the cells were constructed, they have been filled to the engineered capacity with the waste rock material created by coal mining operations. The waste material was then covered with topsoil or substitute topsoil and revegetated to a condition that should ultimately support the post-mining land use.

Because the cells were filled to capacity at different times, reclamation also occurred at different time periods. Or, because all cells and berms were *not* reseeded at the same time, completion of the operator's *Responsibility Period* for some cells and berms were different. The Responsibility Period is the specific time period required for vegetation establishment on reclaimed lands before the final bond release application can be submitted. This means that for some cells and berms, Phase III Bond Release applications could have been submitted before others. However, previous vegetation studies of the site suggested that it would be most prudent to attempt bond release for all cells and berms at the same time. Therefore, the two consecutive years required to monitor the vegetation on reclaimed lands for Phase III Bond Release has been conducted; quantitative data recorded in 2006 have been summarized in this report. The 2005 data were summarized and submitted in a similar report last year.

METHODS

Sample Areas

The following sites were sampled on the Cottonwood Mine Old Waste Rock Site:

Cell 1	Berm 1
Cell 2	Berm 2
Cell 3	Berm 3
Cell 4	Berm 4
Cell 5	
Cell 6	CTW Reference Area
Cell 7	

All field work to record cover, frequency, composition, and production for the reclaimed and reference areas was accomplished in August 2006. Woody species density measurements for the areas were recorded in September 2006. Data from each of the above areas were first summed separately to identify differences between sites, but the mean combined totals of all areas were the values used for final bond release comparisons with the reference area. The number of samples taken was a function of both the size of each area and employment sample adequacy formulas. In other words, in larger areas more samples were taken than the smaller areas, but the total number of samples were subject to the rigors of statistical sample adequacy.

Cover, Frequency and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional

information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows "A Utah Flora" (Welsh et al. 2003).

Woody Species Density

Density of woody plant species of the reclaimed and reference areas were recorded using a distance method called the point-quarter. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Production

Total annual biomass production was estimated by clipping, drying and weighing current annual growth in each sample quadrat. "Double sampling" using four quadrats were estimated around the clipped quadrat. Herbaceous and woody species production were recorded separately.

Diversity

There are several good methods to assess diversity in plant communities. Three diversity indices have been reported in this document for the reclaimed areas and the reference area. To begin,

MacArthur's Diversity Index was calculated. This index is an effective diversity measurement and is computed using the equation $1/\sum pi^2$ (MacArthur and Wilson 1976, *The Theory of Island Biogeography*, Princeton: Princeton University Press). In this equation *pi* is the proportion of sum frequency contributed by the *i*th species in the sample area of concern. The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species. In other words, this index provides greater weight to those species that are present more often (with greater frequency) than those that are merely "present" in one or two quadrats. The **average number of species** per sample quadrat is another measure of species diversity provided from the data in this report. Finally, the *total number of species present* in the sample quadrats, or "**Richness**", was calculated for the sample areas.

Sample Sizes

Sample sizes for cover, woody species density and productivity of each area are given below.

Sample Sizes for Vegetation Monitoring in the Old Cottonwood Waste Rock Site (2006)			
Reclaimed Area			
	COVER	DENSITY	PRODUCTION
Cell 1	7	20	15
Cell 2	7	20	15
Cell 3	10	30	20
Cell 4	10	35	25
Cell 5	10	35	25
Cell 6	10	35	25
Cell 7	15	40	30
Berm 1	5	10	5
Berm 2	5	10	5
Berm 3	10	20	10
Berm 4	5	10	5
TOTAL	**94**	**265**	**180**
Reference Area			
	COVER	DENSITY	PRODUCTION
TOTAL	**140**	**90**	**240**

Sample Adequacy & Statistical Comparisons

As recommended by the State of Utah, Department of Natural Resources, Division of Oil, Gas & Mining (DOGM) guidelines, sampling adequacy was calculated. The goal for the parameters of this study was 90% confidence level with a 10% change in mean (one-tailed t-value was used).

The sample adequacy formula used is given below.

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

where,

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

Student's t-tests were employed to compare the reclaimed areas with the reference area for living cover, density and productivity. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to check or apply further statistical tests if desired.

Photographs

Color photographs of each cell, berm and the reference area were taken during the sample period and have been included with this report.

Raw Data

The raw cover, composition, and frequency data have been summarized on spreadsheets and have been included in the Appendix.

RESULTS

Reclaimed Areas

The mean total living cover for the cells and berms combined was 53.30% (Table 1-A). This living cover was comprised of 50.77% grasses, 42.72% shrubs, and 6.51% forbs (Table 1-B). A total of 16 plant species were present in the sample quadrats (Table 1-C).

The dominant plant species by cover and frequency were fourwing saltbush (*Atriplex canescens*), Indian ricegrass (*Stipa hymenoides*), broom snakeweed (*Gutierrezia sarothrae*), and crested wheatgrass (*Agropyron cristatum*). The cover and frequency values for each species present in the quadrats are shown in Table 2.

The mean total woody species density for the combined cells and berms was estimated at 5,345 individuals per acre (Table 3-A). The density in these areas was dominated by broom snakeweed and fourwing saltbush.

For production of the site, the total annual biomass was estimated at 1,353.31 pounds per acre, 741.44 of which was from the woody component and 611.87 from herbaceous plants (Table 3-B).

Reference Area

The total living cover (overstory plus understory) of the reference area, a pinyon-juniper plant community, was 34.67% (Table 4-A). The overstory and understory cover were nearly equally represented at 16.73% and 17.94%, respectively. The understory cover was comprised of 71.95% woody species and 15.98% forbs (Table 4-B). A total of 12 plant species were present in the sample quadrats (Table 4-C).

As depicted in the cover and frequency values of the reference area, the dominate plant species were pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). For a list of all species with their cover and frequency values, refer to Table 5.

Woody species density for the reference area was estimated at 1,360 plants per acre and was dominated by the same two species as in the cover measurements above, however, Mormon tea (*Ephedra viridis*) was also an important component here (Table 6-A).

Total annual biomass for the reference area was estimated at 453.41 pounds per acre, nearly all of it consisted of woody species (Table 6-B).

Comparisons Between Areas

Statistical analyses using Student's t-tests were employed to compare the total living cover,

woody species density and productivity of the reclaimed area with the reference area. These parameters are some of the most important subject fields in applying for Phase III Bond Release. For all of these parameters, the reclaimed areas (cells and berms) were significantly greater than the reference area (Table 7).

DISCUSSION

The tables referenced in the RESULTS section above provide a good summary of the quantitative sampling results for the reclaimed cells and berms as well as the reference area chosen for revegetation success standards. Statistical analyses have also been employed to compare the two areas with results strongly suggesting that the reclaimed areas have met specific revegetation standards. The summaries and statistical analyses have reported the data of the reclaimed areas (cells and berms combined) for total living cover, frequency, composition, woody species density, and annual productivity. To provide a visual assessment of the quantitative data at the Old Waste Rock Site, charts graphically illustrate the values of each parameter on a site-by-site basis.

Total Living Cover

The mean combined total living cover of all cells, berms, and reference area have been discussed and compared previously in this report. To provide greater detail and to elaborate on this parameter, a graph comparing the cover of: 1) all cells individually, 2) all cells combined, and 3)

the reference area has been prepared (Fig. 1). As one can note by the graph, each cell exceeds the total living cover of the reference area.

Along this same premise, another graph (Fig. 2) compares the total living cover of: 1) each individual berm, 2) all berms combined, and 3) the reference area. The total living cover of each berm also exceeds that of the reference area.

As reported in previous vegetation monitoring reports, there were isolated areas within some cells (i.e. Cell 6) where the cover was dominated by "weedy" species. Individual sample quadrat testify to this, but because the sample size is so large, it did not affect the final outcome of the sampling. Also worth noting is that due to several consecutive drought years in the area that occurred prior to the 2005 and 2006 sample periods, cover and diversity may have negatively impacted the plant communities of the area. Hopefully, a return to the normal precipitation patterns will also affect the reclaimed land in a more positive way.

Finally, Fig. 3 shows the mean of all cells and berms compared to the reference area. This illustration shows the Phase III Bond Release parameters used in the statistical analyses reported in the RESULTS section of this report.

Woody Species Density

The same areas as explained above for the total living cover have been illustrated graphically for

woody species densities. Consequently, Fig. 4 shows the densities for: 1) all cells individually, 2) all cells combined, and 3) the reference area. Again, each cell exceeds the woody species density of the reference area.

Fig. 5 presents the densities for: 1) each individual berm, 2) all berms combined, and 3) the reference area. The reclaimed berm densities also exceed those of the reference area.

Finally, Fig. 6 shows the densities of all cells and berms combined and compares this value to the reference area, or an illustration that shows the parameters used in the statistical analyses employed in the RESULTS section of this report.

Biomass Production

Similarly, productivity has been compared graphically for each of the cells, berms and reference area. Fig. 7 shows the biomass production of: 1) each cell individually, 2) cells combined, and 4) the reference area.

Fig. 8 shows the same comparisons for each berm, combined berms, and reference area. In both cases, each cell or berm production estimate exceeds that of the reference area. Finally, the production of all cells and berms combined are compared with the reference area in Fig. 9.

Composition

Lifeform composition of the combined total living cover for the reclaimed areas and reference area was described and summarized in the tables of the RESULTS section in this report. Fig. 10 graphically illustrates the proportions of woody, forb and grass species for the reclaimed areas, whereas, Fig. 11 shows these proportions for the reference area.

Species Diversity

Three diversity indices have been used to compare the reclaimed areas with the reference area. They were the following: 1) the Average Number of Species per Quadrat, 2) MacArthur's Index, and 3) Richness. These indices are shown graphically in Fig. 12 and numerically in Fig. 13. The indices suggest that the reclaimed areas are more diverse than the reference area.

SUMMARY & CONCLUSIONS

The appropriate time period required for vegetation establishment on the reclaimed Old Waste Rock Site has passed. This means that an application for *final* or Phase III Bond Release can be submitted to the State of Utah. To receive Phase III Bond Release, the reestablished vegetation of the reclaimed land must meet specific state and federal requirements as specified by the State of Utah, Division of Oil, Gas & Mining. As dictated by the rules, vegetative cover must be "diverse, effective and permanent". Accordingly, there are specific requirements associated with

cover, density, production and diversity of reclaimed lands.

Data summaries from quantitatively monitoring of the reclaimed vegetation of the Cottonwood Mine Old Waste Rock Site along with those of a pinyon-juniper reference area, chosen to provide standards of revegetation success, have been submitted. The total living cover, woody species density, and biomass productivity of the reclaimed areas have been statistically compared to the reference area. Additionally, lifeform composition, species frequency, and diversity have been summarized for comparisons with the reference area. Finally, the data of individual cells and berms were separated and plotted to graphically compare the parameters of each site.

This document reports the results of sampling in Year 2 (2006), or the second of two consecutive years required from quantitatively sampling the plant communities that have become established on the reclaimed areas. Results herein, along with those reported previously for Year 1 (2005), suggest that the Cottonwood Mine Old Waste Rock Site meets or exceeds those revegetation success standards set by the pinyon-juniper reference area.

TABLE 1: Total cover (A), composition (B), and species present (C), summary for the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2006).

A.

TOTAL COVER	% MEAN COVER
Living Cover	**53.30**
Litter	14.79
Bareground	11.74
Rock	20.17

STANDARD DEVIATION (*s*) = 14.32
SAMPLE SIZE (*n*) = 94.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 19.53

B.

COMPOSITION	PERCENT COMPOSITION	STANDARD DEVIATION
Shrubs	42.72	34.21
Forbs	6.51	19.43
Grasses	50.77	33.64

SAMPLE SIZE (*n*) = 94.00

C.

SPECIES PRESENT

Agropyron cristatum
Atriplex canescens
Atriplex gardneri
Bromus tectorum
Cercocarpus montanus
Chrysothamnus nauseosus
Elymus lanceolatus
Elymus smithii
Elymus spicatus
Ephedra viridis
Gutierrezia sarothrae
Halogeton glomeratus
Hilaria jamesii
Malcomia africana
Stipa comata
Stipa hymenoides

TABLE 2 : Cover and frequency values for each plant species in the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2006).

	MEAN	FREQUENCY
TREES & SHRUBS		
Atriplex canescens	15.43	54.26
Atriplex gardneri	0.21	1.06
Cercocarpus montanus	0.64	2.13
Chrysothamnus nauseosus	1.01	3.19
Ephedra viridis	0.80	3.19
Gutierrezia sarothrae	7.86	55.32
FORBS		
Halogeton glomeratus	0.49	3.19
Malcomia africana	0.11	1.06
GRASSES		
Agropyron cristatum	6.12	38.30
Bromus tectorum	2.71	22.34
Elymus lanceolatus	1.76	14.89
Elymus smithii	2.55	15.96
Elymus spicatus	0.69	5.32
Hilaria jamesii	0.59	4.26
Stipa comata	2.71	10.64
Stipa hymenoides	9.63	35.11

SAMPLE SIZE (n) = 94.00

TABLE 3 : Woody species densities (A) and productivity (B) for the reclaimed cells and berms at Cottonwood Mine's Old Waste Rock Site (2006).

A.

WOODY SPECIES DENSITY	NUMBER/ACRE
Artemisia tridentata	80.68
Atriplex confertifolia	25.21
Atriplex canescens	2092.72
Ceratoides lanata	5.04
Chrysothamnus nauseosus	65.56
Ephedra viridis	216.84
Gutierrezia sarothrae	2854.17
Opuntia polyacantha	5.04
MEAN TOTAL ($\bar{X}$)	5345.26

STANDARD DEVIATION (*s*) = 3762.00
SAMPLE SIZE (*n*) = 265.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 134.00

B.

PRODUCTION	POUNDS/ACRE
Herbaceous	611.87
Woody	741.44
MEAN TOTAL ($\bar{X}$)	1353.31

STANDARD DEVIATION (*s*) = 750.64
SAMPLE SIZE (*n*) = 180.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 83.25

TABLE 4: Total cover (A), composition (B), and species present (C), summary for the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2006).

A.

TOTAL COVER	% MEAN COVER
Overstory Cover	16.73
Understory Cover	17.94
Total Living Cover	**34.67**
Litter	33.27
Bareground	25.55
Rock	23.45

STANDARD DEVIATION (*s*) = 23.62
SAMPLE SIZE (*n*) = 140.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 125.60

B.

COMPOSITION	PERCENT COMPOSITION	STANDARD DEVIATION
Trees & Shrubs	71.95	44.30
Forbs	15.98	35.89
Grasses	0.00	0.00

SAMPLE SIZE (*n*) = 140.00

C.

SPECIES PRESENT

Ephedra viridis
Eriogonum bicolor
Euphorbia fendleri
Chamaesyce fendleri
Cercocarpus montanus
Gutierrezia sarothrae
Juniperus osteosperma
Lepidium montanum
Opuntia polyacantha
Penstemon sp.
Pinus edulis
Yucca harrimaniae

TABLE 5 : Cover and frequency values for each plant species in the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2006).

	MEAN	FREQUENCY
OVERSTORY		
Juniperus osteosperma	8.50	28.57
Pinus edulis	8.23	26.43
TREES & SHRUBS		
Cercocarpus montanus	1.44	5.71
Ephedra viridis	2.79	12.86
Gutierrezia sarothrae	0.05	0.71
Juniperus osteosperma	4.36	20.00
Opuntia polyacantha	0.19	4.29
Pinus edulis	8.07	35.71
Yucca harrimaniae	0.08	1.43
FORBS		
Eriogonum bicolor	0.39	9.29
Euphorbia fendleri	0.39	9.29
GRASSES		

SAMPLE SIZE (*n*) =140.00

TABLE 6: Woody species densities (A) and productivity (B) for the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2006).

A.

WOODY SPECIES DENSITY	NUMBER/ACRE
Cercocarpus montanus	79.31
Echinocereus whipplei	
Ephedra viridis	241.72
Gutierrezia sarothrae	11.33
Juniperus osteosperma	347.47
Opuntia polyacantha	41.54
Pinus edulis	596.74
Yucca harrimaniae	41.54
MEAN TOTAL ($\bar{X}$)	1359.65

STANDARD DEVIATION (*s*) = 410.68
SAMPLE SIZE (*n*) = 90.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 24.69

B.

PRODUCTION	POUNDS/ACRE
Herbaceous	1.33
Woody	452.08
MEAN TOTAL ($\bar{X}$)	453.41

STANDARD DEVIATION (*s*) = 286.65
SAMPLE SIZE (*n*) = 240.00
MINIMUM ADEQUATE SAMPLE (*nMIN*) = 108.16

TABLE 7: Statistical summary sheet for the reclaimed cells and berms and the CTW Reference Area at Cottonwood Mine's Old Waste Rock Site (2006).

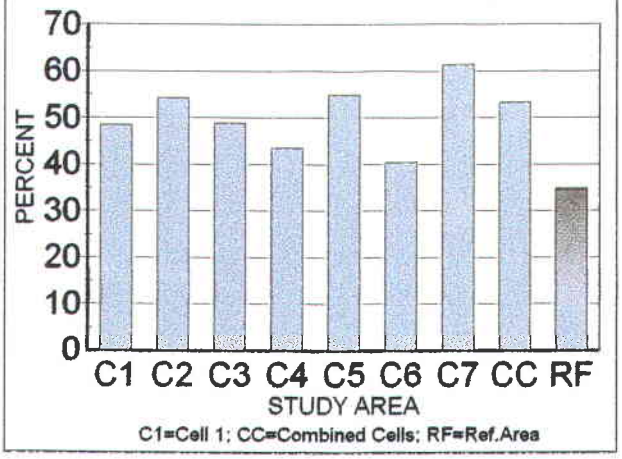
RECLAIMED AREAS			
Total Living Cover	$\bar{x}$=53.30	s=14.32	n=94
Density	$\bar{x}$=5345.26	s=3762.00	n=265
Productivity	$\bar{x}$=1353.31	s=750.64	n=180
REFERENCE AREA			
Total Living Cover*	$\bar{x}$=34.67	s=23.62	n=140
Density	$\bar{x}$=1359.65	s=410.68	n=90
Productivity	$\bar{x}$=453.41	s=286.65	n=240
STATISTICAL ANALYSES			
Total Living Cover	t=6.846	df=232	SL=p<.001
Density	t=10.012	df=353	SL=p<.001
Productivity	t=16.988	df=418	SL=p<.001

$\bar{x}$ = sample mean,
s = sample standard deviation,
n = sample size,
t = Student's t-value,
p=probability level
df = degrees of freedom,
SL = significance level,
* represents understory and overstory cover combined.

FIGURES

FIG. 1: LIVING COVER: CELLS & REFERENCE AREA

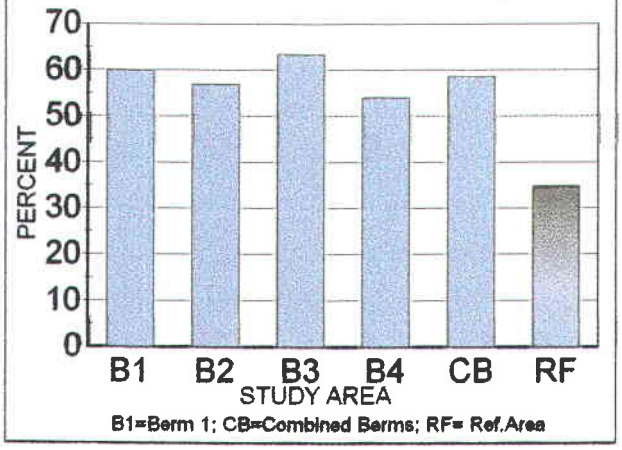
COTTONWOOD OLD WASTE ROCK SITE (2006)



C1=Cell 1; CC=Combined Cells; RF=Ref.Area

FIG. 2: COVER: BERMS AND REFERENCE AREA

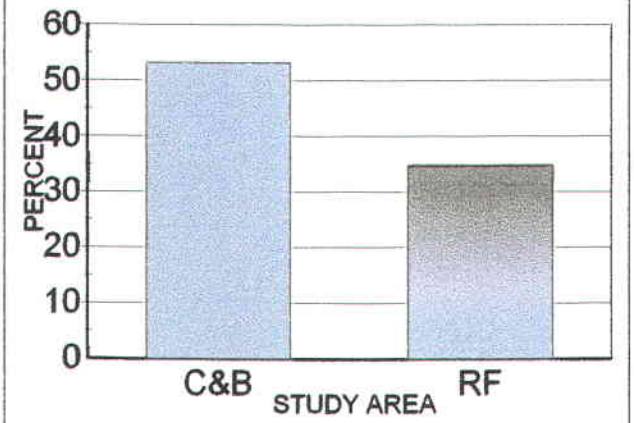
COTTONWOOD OLD WASTE ROCK SITE (2006)



B1=Berm 1; CB=Combined Berms; RF= Ref.Area

FIG. 3: LIVING COVER

COTTONWOOD OLD WASTE: ROCK SITE (2006)



C=Cells; B=Berms; RF=Ref.Area

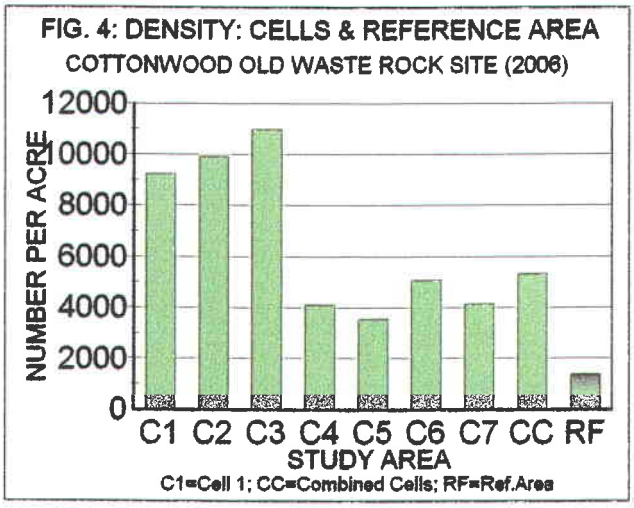


FIG. 4: DENSITY: CELLS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2006)
NUMBER PER ACRE
12000
10000
8000
6000
4000
2000
0
C1 C2 C3 C4 C5 C6 C7 CC RF
STUDY AREA
C1=Cell 1; CC=Combined Cells; RF=Ref.Area

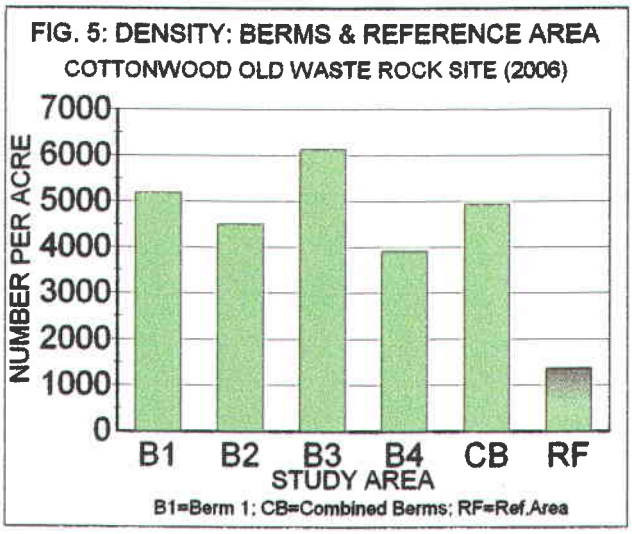


FIG. 5: DENSITY: BERMS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2006)
NUMBER PER ACRE
7000
6000
5000
4000
3000
2000
1000
0
B1 B2 B3 B4 CB RF
STUDY AREA
B1=Berm 1; CB=Combined Berms; RF=Ref.Area

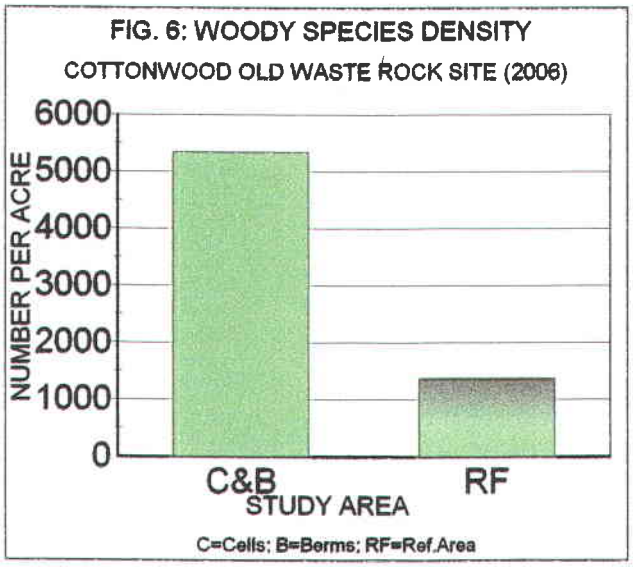


FIG. 6: WOODY SPECIES DENSITY
COTTONWOOD OLD WASTE ROCK SITE (2006)
NUMBER PER ACRE
6000
5000
4000
3000
2000
1000
0
C&B
RF
STUDY AREA
C=Cells; B=Berms; RF=Ref.Area

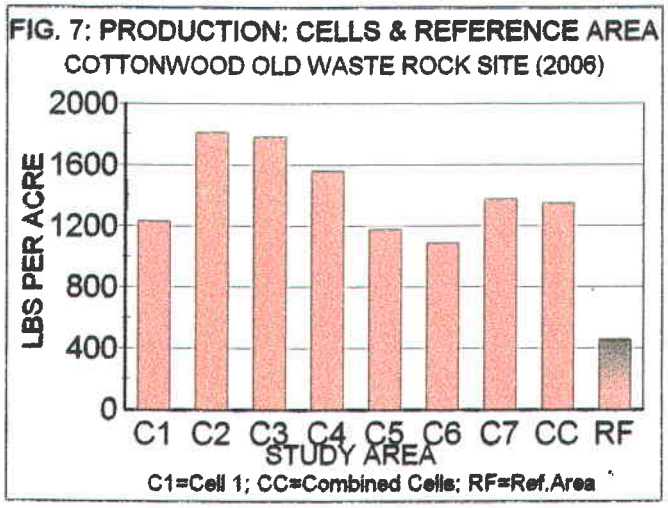


FIG. 7: PRODUCTION: CELLS & REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2006)
LBS PER ACRE
2000
1600
1200
800
400
0
C1 C2 C3 C4 C5 C6 C7 CC RF
STUDY AREA
C1=Cell 1; CC=Combined Cells; RF=Ref.Area

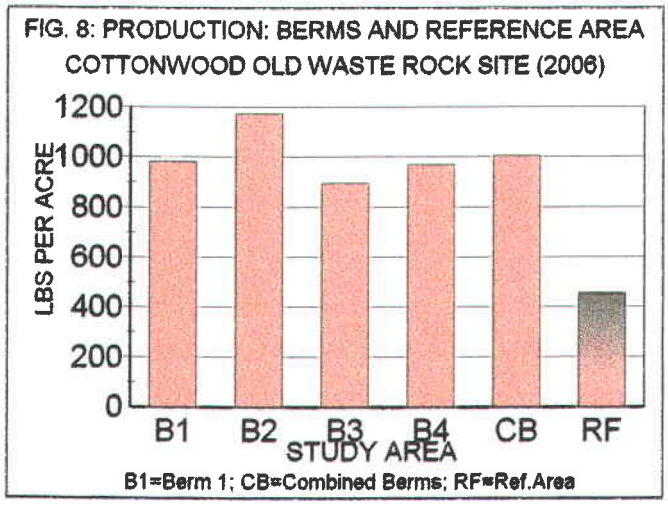


FIG. 8: PRODUCTION: BERMS AND REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2006)
LBS PER ACRE
1200
1000
800
600
400
200
0
B1 B2 B3 B4 CB RF
STUDY AREA
B1=Berm 1; CB=Combined Berms; RF=Ref.Area

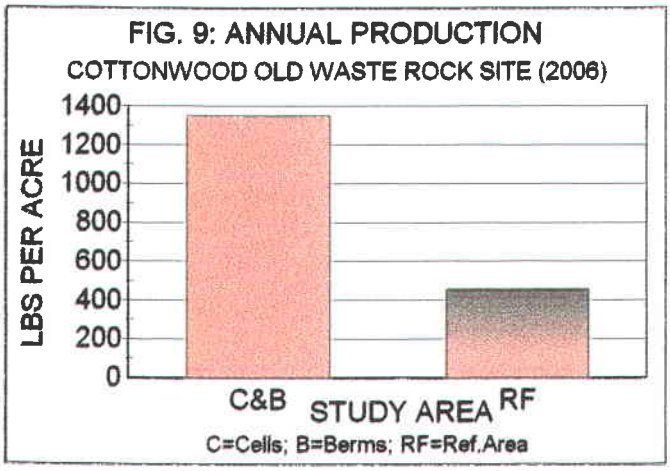


FIG. 9: ANNUAL PRODUCTION
COTTONWOOD OLD WASTE ROCK SITE (2006)
LBS PER ACRE
1400
1200
1000
800
600
400
200
0
C&B
STUDY AREA
RF
C=Cells; B=Berms; RF=Ref.Area

FIG. 10: COMPOSITION - CELLS & BERMS COMBINED
Cottonwood Old Waste Rock Site (2006)

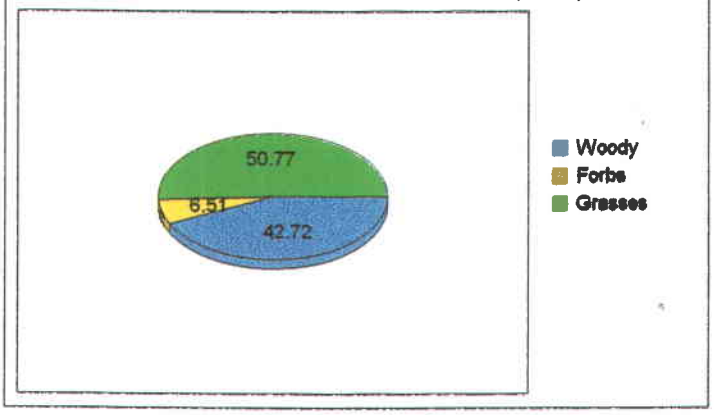
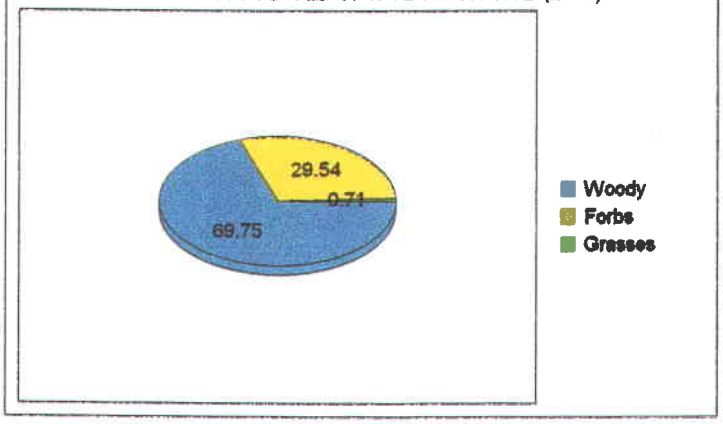


FIG. 11: COMPOSITION - REFERENCE AREA
COTTONWOOD OLD WASTE ROCK SITE (2006)



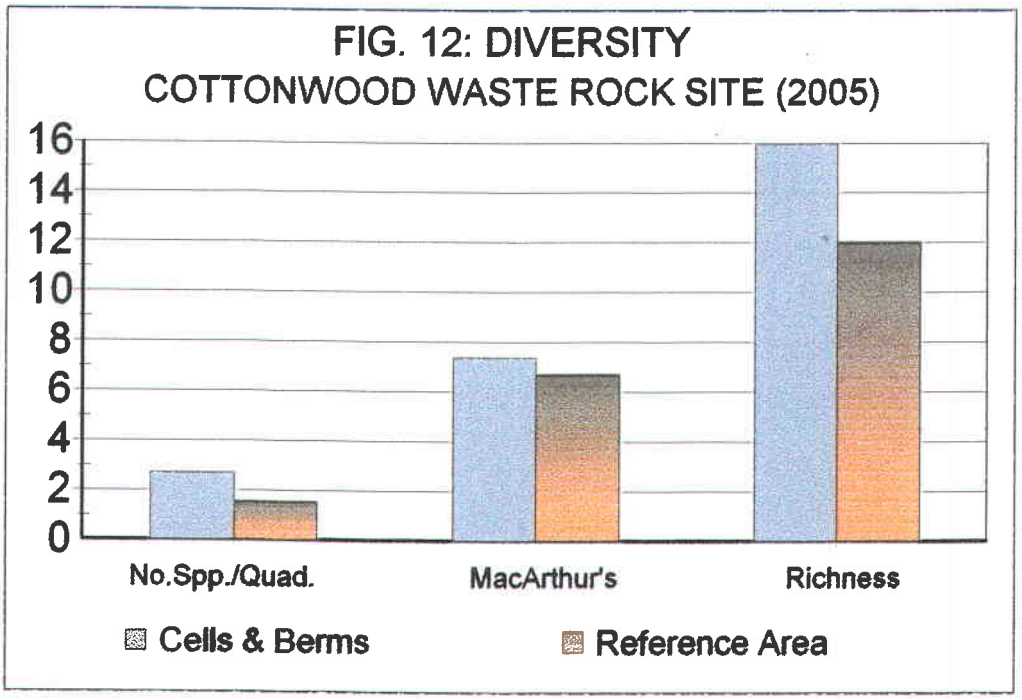


FIG. 12: DIVERSITY
COTTONWOOD WASTE ROCK SITE (2005)
16
14
12
10
8
6
4
2
0
No.Spp./Quad.
MacArthur's
Richness
Cells & Berms
Reference Area

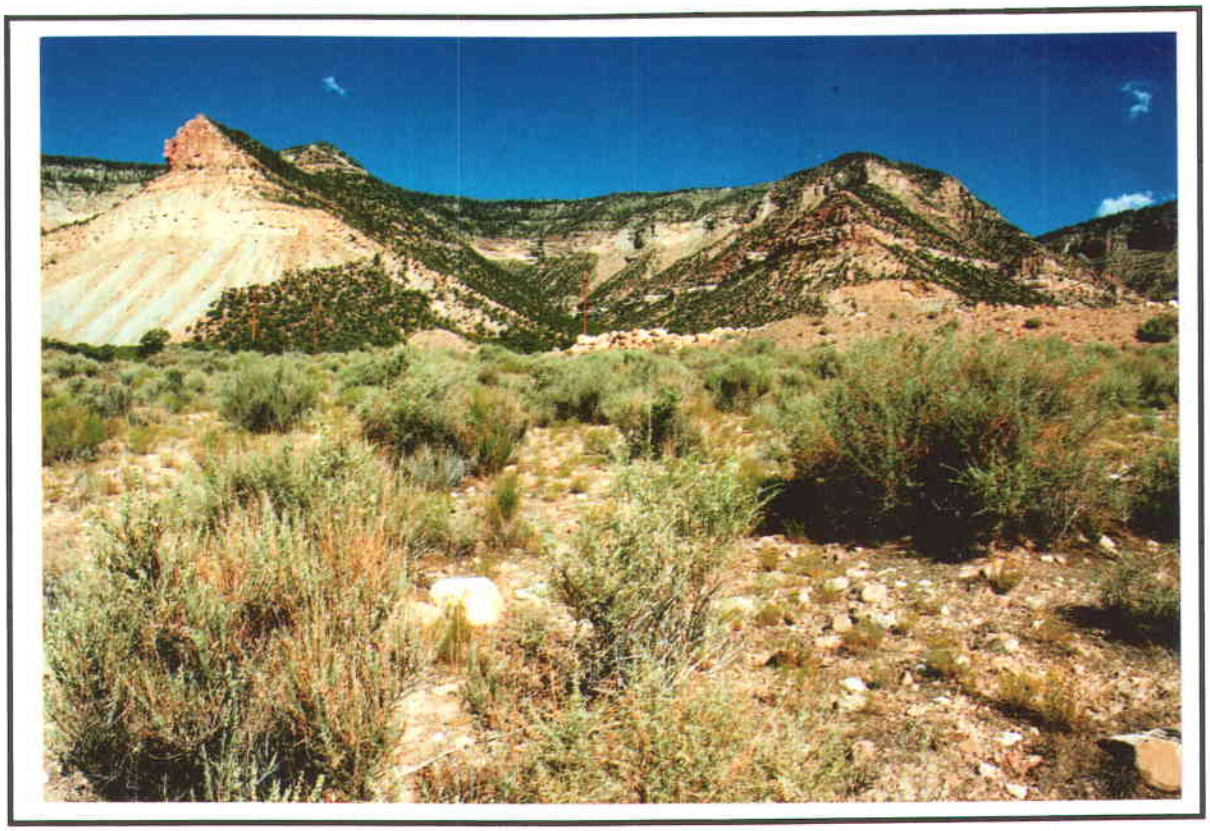
FIG. 13. Diversity at the Cottonwood Mine Old Waste Rock Site (2006)

A.
MacArthur's Index ($1/\sum p^2$) =
Reclaimed Cells & Berms: 7.392
Reference Area: 6.889

B.
Average No. Species/Quadrat =
Reclaimed Cells & Berms: 2.70
Reference Area: 1.54

C.
Richness =
Reclaimed Cells & Berms: 16.0
Reference Area: 12.0

COLOR PHOTOGRAPHS
OF THE
SAMPLE AREAS



Cell 1

Cell 2

Cell 3

Cell 4

Cell 5

Cell 6

Cell 7

Berm 1

Berm 2

Berm 3 (1 of 2)

Berm 3 (2 of 2)

Berm 4

Pinyon-Juniper CTW Reference Area (1 of 2)

Pinyon-Juniper CTW Reference Area (2 of 2)

APPENDIX

Summarized Raw Data

ENERGY WEST MINING
Cells & Berms Combined Cell 1
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 0 -1 deg.

Sample Date: 10-12 Aug 2006	1.00	2.00	3.00	4.00	5.00	6.00	7.00
TREES & SHRUBS							
Atriplex canescens	0.00	15.00	0.00	0.00	0.00	10.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cercocarpus montanus	0.00	0.00	0.00	0.00	55.00	0.00	5.00
Chrysothamnus nauseosus	0.00	0.00	0.00	45.00	0.00	10.00	0.00
Ephedra viridis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	30.00	15.00	30.00	0.00	0.00	5.00	5.00
FORBS							
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Malcomia africana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Agropyron cristatum	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Bromus tectorum	0.00	15.00	15.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	0.00	0.00	10.00	0.00	10.00	5.00	0.00
Elymus smithii	0.00	0.00	0.00	15.00	0.00	0.00	0.00
Elymus spicatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa comata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	5.00	30.00
COVER							
Total Living Cover	30.00	55.00	55.00	60.00	65.00	35.00	40.00
Litter	10.00	30.00	25.00	20.00	10.00	10.00	15.00
Bareground	20.00	5.00	10.00	10.00	15.00	40.00	35.00
Rock	40.00	10.00	10.00	10.00	10.00	15.00	10.00
% COMPOSITION							
Shrubs	100.00	54.55	54.55	75.00	84.62	71.43	25.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	0.00	45.45	45.45	25.00	15.38	28.57	75.00

Cell 2 Cell 3

1.00	2.00	3.00	4.00	5.00	6.00	7.00	1.00	2.00	3.00
40.00	30.00	0.00	20.00	0.00	0.00	0.00	0.00	15.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	20.00	10.00	20.00	15.00	29.00	30.00	15.00	20.00	15.00
0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	20.00	0.00	40.00	5.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00	25.00	0.00
70.00	75.00	40.00	50.00	65.00	35.00	45.00	30.00	70.00	50.00
20.00	15.00	40.00	25.00	10.00	5.00	10.00	10.00	5.00	10.00
5.00	5.00	5.00	10.00	15.00	10.00	15.00	15.00	5.00	5.00
5.00	5.00	15.00	15.00	10.00	50.00	30.00	45.00	20.00	35.00
71.43	66.67	25.00	80.00	23.08	82.86	66.67	50.00	50.00	50.00
0.00	0.00	0.00	0.00	0.00	2.86	0.00	0.00	0.00	30.00
28.57	33.33	75.00	20.00	76.92	14.29	33.33	50.00	50.00	20.00

Cell 4

4.00	5.00	6.00	7.00	8.00	9.00	10.00	1.00	2.00	3.00
10.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	25.00	25.00	15.00	0.00	15.00	40.00	0.00	5.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	15.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	5.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	20.00	50.00	0.00	0.00	15.00	40.00
45.00	35.00	50.00	75.00	30.00	65.00	40.00	40.00	35.00	50.00
25.00	40.00	20.00	10.00	25.00	10.00	10.00	10.00	5.00	10.00
5.00	5.00	10.00	5.00	5.00	5.00	30.00	15.00	10.00	35.00
25.00	20.00	20.00	10.00	40.00	20.00	20.00	35.00	50.00	5.00
22.22	0.00	0.00	53.33	0.00	0.00	0.00	0.00	0.00	0.00
44.44	71.43	50.00	20.00	0.00	23.08	100.00	0.00	14.29	20.00
33.33	28.57	50.00	26.67	100.00	76.92	0.00	100.00	85.71	80.00

Cell 5

4.00	5.00	6.00	7.00	8.00	9.00	10.00	1.00	2.00	3.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	10.00	5.00	0.00	35.00	10.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	0.00	0.00	55.00	0.00	0.00
0.00	25.00	0.00	0.00	30.00	5.00	0.00	0.00	0.00	15.00
0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00
55.00	0.00	15.00	35.00	0.00	0.00	35.00	0.00	0.00	0.00
65.00	45.00	45.00	40.00	30.00	40.00	45.00	55.00	40.00	35.00
10.00	20.00	40.00	5.00	20.00	15.00	5.00	15.00	10.00	15.00
5.00	10.00	10.00	15.00	15.00	20.00	20.00	10.00	15.00	20.00
20.00	25.00	5.00	40.00	35.00	25.00	30.00	20.00	35.00	30.00
0.00	0.00	0.00	12.50	0.00	87.50	22.22	0.00	25.00	57.14
15.38	0.00	22.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84.62	100.00	77.78	87.50	100.00	12.50	77.78	100.00	75.00	42.86

Cell 6

4.00	5.00	6.00	7.00	8.00	9.00	10.00	1.00	2.00	3.00
30.00	25.00	30.00	15.00	60.00	35.00	20.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	40.00	0.00	25.00	5.00	0.00	0.00	20.00	0.00	0.00
0.00	0.00	5.00	10.00	0.00	0.00	0.00	10.00	0.00	10.00
15.00	0.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	15.00	15.00	0.00	0.00	20.00	0.00	0.00	10.00
75.00	65.00	70.00	65.00	70.00	35.00	40.00	35.00	25.00	50.00
15.00	15.00	20.00	15.00	20.00	40.00	20.00	20.00	10.00	20.00
5.00	10.00	5.00	5.00	5.00	10.00	15.00	10.00	25.00	10.00
5.00	10.00	5.00	15.00	5.00	15.00	25.00	35.00	40.00	20.00
46.67	38.46	42.86	23.08	85.71	100.00	50.00	14.29	20.00	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	0.00
53.33	61.54	57.14	76.92	14.29	0.00	50.00	85.71	0.00	60.00

Cell 7

4.00	5.00	6.00	7.00	8.00	9.00	10.00	1.00	2.00	3.00
0.00	25.00	0.00	15.00	30.00	25.00	0.00	0.00	30.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	30.00
25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	5.00	0.00	15.00	0.00	0.00	0.00	0.00
0.00	15.00	25.00	10.00	20.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	60.00	15.00	10.00
25.00	50.00	25.00	35.00	50.00	50.00	60.00	65.00	50.00	40.00
10.00	10.00	10.00	25.00	10.00	10.00	15.00	10.00	20.00	10.00
35.00	10.00	15.00	15.00	10.00	10.00	5.00	10.00	10.00	35.00
30.00	30.00	50.00	25.00	30.00	30.00	20.00	15.00	20.00	15.00
0.00	60.00	0.00	42.86	60.00	50.00	0.00	7.69	60.00	75.00
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	40.00	100.00	57.14	40.00	50.00	100.00	92.31	40.00	25.00

4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00
15.00	10.00	5.00	15.00	10.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	0.00	15.00	10.00	5.00	60.00	20.00
50.00	50.00	10.00	40.00	40.00	50.00	45.00	50.00	0.00	40.00
65.00	70.00	60.00	60.00	70.00	65.00	60.00	70.00	70.00	60.00
20.00	10.00	15.00	15.00	10.00	10.00	15.00	10.00	10.00	25.00
5.00	5.00	10.00	10.00	10.00	10.00	10.00	5.00	5.00	5.00
10.00	15.00	15.00	15.00	10.00	15.00	15.00	15.00	15.00	10.00
23.08	14.29	83.33	25.00	14.29	0.00	0.00	14.29	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76.92	85.71	16.67	75.00	85.71	100.00	100.00	85.71	100.00	100.00

Berm 1						Berm 2			
14.00	15.00	1.00	2.00	3.00	4.00	5.00	1.00	2.00	3.00
0.00	0.00	60.00	45.00	30.00	20.00	65.00	35.00	5.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	10.00	15.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
5.00	15.00	0.00	0.00	5.00	10.00	0.00	0.00	60.00	20.00
0.00	0.00	0.00	15.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Total Avg.				
65.00	50.00	57.50		55.00	49.26		55.00	65.00	45.00
10.00	30.00	20.00		10.00	16.33		10.00	10.00	15.00
10.00	10.00	10.00		15.00	12.22		10.00	5.00	10.00
15.00	10.00	12.50		20.00	19.88		25.00	20.00	30.00
0.00	0.00			72.73			00.00	7.69	55.56
0.00	0.00			0.00			0.00	0.00	0.00
100.00	100.00			27.27			0.00	92.31	44.44

Berm 3

4.00	5.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
40.00	30.00	55.00	30.00	0.00	40.00	75.00	60.00	70.00	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	65.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	0.00	5.00	5.00	0.00	0.00	10.00	5.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	20.00	10.00	20.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	55.00	65.00	70.00	70.00	55.00	75.00	70.00	75.00	70.00
10.00	10.00	15.00	10.00	15.00	35.00	20.00	10.00	15.00	10.00
10.00	10.00	10.00	10.00	10.00	5.00	4.00	10.00	5.00	10.00
15.00	25.00	10.00	10.00	5.00	5.00	1.00	10.00	5.00	10.00
69.23	63.64	84.62	50.00	100.00	72.73	100.00	100.00	100.00	71.43
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.77	36.36	15.38	50.00	0.00	27.27	0.00	0.00	0.00	28.57

Berm 4

9.00	10.00	1.00	2.00	3.00	4.00	5.00	Mean	SDev	Freq
5.00	35.00	20.00	0.00	0.00	35.00	0.00	15.43	19.33	54.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	2.05	1.06
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	5.66	2.13
0.00	0.00	0.00	0.00	0.00	0.00	40.00	1.01	6.21	3.19
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.80	6.70	3.19
0.00	10.00	20.00	5.00	0.00	0.00	10.00	7.86	10.43	55.32
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	3.27	3.19
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	1.03	1.06
20.00	15.00	20.00	5.00	35.00	10.00	0.00	6.12	10.72	38.30
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.71	5.59	22.34
0.00	0.00	0.00	0.00	5.00	0.00	0.00	1.76	6.47	14.89
0.00	0.00	10.00	0.00	0.00	0.00	20.00	2.55	7.39	15.96
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	3.06	5.32
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.59	2.99	4.26
0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.71	10.10	10.64
0.00	0.00	0.00	20.00	5.00	0.00	0.00	9.63	16.57	35.11
25.00	60.00	70.00	35.00	50.00	45.00	70.00	53.30	14.32	
5.00	15.00	5.00	15.00	15.00	10.00	5.00	14.79	8.15	
40.00	5.00	5.00	10.00	10.00	15.00	15.00	11.74	8.15	
30.00	20.00	20.00	40.00	25.00	30.00	10.00	20.17	11.55	
20.00	75.00	57.14	14.29	10.00	77.78	71.43	42.72	34.21	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.51	19.43	
80.00	25.00	42.86	85.71	90.00	22.22	28.57	50.77	33.64	

ENERGY WEST MINING
CTW Reference Area
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 1 - 5 deg.

Sample Date: 10-12 Aug 2006	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	40.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY							
SHRUBS							
Cercocarpus montanus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ephedra viridis	0.00	0.00	0.00	0.00	0.00	7.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	20.00	0.00	15.00	0.00	0.00	0.00
Opuntia polyacantha	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	35.00	0.00	7.00	55.00	0.00	0.00	40.00
Yucca harrimaniae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Eriogonum bicolor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Euforbia fendleri	0.00	5.00	0.00	0.00	5.00	0.00	0.00
GRASSES							
COVER							
Overstory	40.00	0.00	0.00	0.00	0.00	0.00	0.00
Understory	35.00	25.00	7.00	70.00	5.00	7.00	40.00
Litter	40.00	10.00	15.00	20.00	30.00	53.00	20.00
Bareground	20.00	55.00	25.00	5.00	10.00	10.00	30.00
Rock	5.00	10.00	53.00	5.00	55.00	30.00	10.00
% COMPOSITION							
Shrubs	100.00	80.00	100.00	100.00	0.00	100.00	100.00
Forbs	0.00	20.00	0.00	0.00	100.00	0.00	0.00
Grasses	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Overstory + Understory	75.00	25.00	7.00	70.00	5.00	7.00	40.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	20.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	50.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
40.00	20.00	0.00	25.00	0.00	5.00	0.00	20.00	15.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	2.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	20.00	0.00	0.00	5.00	0.00	20.00	50.00	25.00
40.00	20.00	2.00	25.00	12.00	5.00	5.00	20.00	15.00	50.00
45.00	10.00	15.00	20.00	10.00	30.00	10.00	55.00	50.00	20.00
5.00	30.00	78.00	35.00	58.00	55.00	65.00	20.00	5.00	25.00
10.00	50.00	5.00	20.00	20.00	10.00	20.00	5.00	30.00	5.00
100.00	100.00	0.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00
0.00	0.00	100.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	20.00	22.00	25.00	12.00	10.00	5.00	40.00	65.00	75.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	5.00	30.00	0.00	25.00	35.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	35.00	0.00	0.00	0.00	60.00	8.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	30.00	30.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	7.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	30.00	0.00	25.00	35.00	0.00	0.00	0.00	0.00
10.00	5.00	1.00	35.00	3.00	30.00	45.00	60.00	15.00	35.00
14.00	5.00	69.00	20.00	55.00	40.00	20.00	10.00	20.00	10.00
36.00	55.00	10.00	5.00	12.00	10.00	15.00	10.00	45.00	35.00
40.00	35.00	20.00	40.00	30.00	20.00	20.00	20.00	20.00	20.00
100.00	0.00	0.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
0.00	60.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	31.00	35.00	28.00	65.00	45.00	60.00	15.00	35.00

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00
0.00	35.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00
35.00	0.00	15.00	0.00	0.00	0.00	5.00	0.00	0.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	30.00	0.00	0.00	15.00	0.00	0.00	35.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	35.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	35.00
35.00	30.00	15.00	5.00	15.00	7.00	35.00	35.00	35.00	30.00
10.00	60.00	50.00	10.00	10.00	20.00	30.00	55.00	40.00	50.00
30.00	5.00	25.00	60.00	45.00	58.00	30.00	5.00	20.00	15.00
25.00	5.00	10.00	25.00	30.00	15.00	5.00	5.00	5.00	5.00
100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00	100.00
0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	65.00	15.00	5.00	15.00	7.00	35.00	65.00	35.00	65.00

38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00	47.00
40.00	35.00	0.00	20.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	0.00	20.00	0.00	20.00	0.00	0.00	40.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	35.00	40.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	25.00	0.00	15.00	0.00	4.00	25.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	3.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40.00	35.00	0.00	40.00	0.00	20.00	15.00	0.00	40.00	0.00
35.00	35.00	40.00	25.00	5.00	15.00	10.00	7.00	25.00	10.00
35.00	10.00	20.00	50.00	5.00	25.00	15.00	3.00	60.00	25.00
20.00	30.00	15.00	5.00	25.00	10.00	25.00	10.00	5.00	15.00
10.00	25.00	25.00	20.00	65.00	50.00	50.00	80.00	10.00	55.00
100.00	100.00	100.00	100.00	0.00	100.00	100.00	57.14	100.00	100.00
0.00	0.00	0.00	0.00	100.00	0.00	0.00	42.86	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75	70.00	40.00	65.00	5.00	35.00	25.00	7.00	65.00	10.00

48.00	49.00	50.00	51.00	52.00	53.00	54.00	55.00	56.00	57.00
15.00	20.00	20.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	45.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	5.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
15.00	20.00	20.00	0.00	5.00	0.00	0.00	35.00	45.00	0.00
30.00	5.00	25.00	5.00	5.00	5.00	70.00	5.00	5.00	5.00
50.00	20.00	55.00	15.00	5.00	20.00	25.00	25.00	85.00	10.00
10.00	50.00	10.00	25.00	70.00	55.00	4.00	20.00	5.00	50.00
10.00	25.00	10.00	55.00	20.00	20.00	1.00	50.00	5.00	35.00
100.00	100.00	100.00	0.00	0.00	0.00	100.00	0.00	100.00	0.00
0.00	0.00	0.00	100.00	100.00	100.00	0.00	100.00	0.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	25.00	45.00	5.00	10.00	5.00	70.00	40.00	50.00	5.00

58.00	59.00	60.00	61.00	62.00	63.00	64.00	65.00	66.00	67.00
0.00	45.00	0.00	35.00	0.00	0.00	0.00	10.00	0.00	15.00
0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	40.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	30.00	0.00	35.00	0.00	25.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	35.00	0.00	0.00	0.00	0.00	10.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	45.00	40.00	35.00	0.00	0.00	0.00	10.00	0.00	15.00
5.00	30.00	35.00	35.00	5.00	25.00	70.00	10.00	40.00	25.00
25.00	55.00	25.00	55.00	5.00	5.00	20.00	60.00	25.00	5.00
60.00	5.00	35.00	5.00	25.00	45.00	5.00	10.00	10.00	10.00
10.00	10.00	5.00	5.00	65.00	25.00	5.00	20.00	25.00	60.00
100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	75.00	75.00	70.00	5.00	25.00	70.00	20.00	40.00	40.00

68.00	69.00	70.00	71.00	72.00	73.00	74.00	75.00	76.00	77.00
0.00	0.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
0.00	0.00	0.00	0.00	35.00	35.00	25.00	15.00	20.00	0.00
0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	65.00	0.00	35.00	35.00	25.00	15.00	20.00	30.00
5.00	25.00	1.00	10.00	35.00	20.00	1.00	1.00	5.00	1.00
10.00	10.00	84.00	10.00	40.00	55.00	24.00	59.00	20.00	74.00
20.00	10.00	10.00	20.00	5.00	10.00	50.00	10.00	25.00	20.00
65.00	55.00	5.00	60.00	20.00	25.00	25.00	30.00	50.00	5.00
0.00	100.00	0.00	100.00	100.00	100.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	25.00	66.00	10.00	70.00	55.00	26.00	16.00	25.00	31.00

78.00	79.00	80.00	81.00	82.00	83.00	84.00	85.00	86.00	87.00
20.00	25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	20.00	0.00	0.00	0.00	50.00	20.00	15.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	40.00	0.00	0.00	7.00	20.00	0.00	40.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
20.00	25.00	20.00	0.00	25.00	0.00	50.00	20.00	15.00	20.00
1.00	15.00	40.00	5.00	5.00	7.00	20.00	5.00	40.00	1.00
10.00	45.00	20.00	20.00	25.00	68.00	65.00	70.00	45.00	24.00
19.00	10.00	20.00	55.00	45.00	20.00	5.00	10.00	5.00	50.00
70.00	30.00	20.00	20.00	25.00	5.00	10.00	15.00	10.00	25.00
0.00	100.00	100.00	0.00	0.00	100.00	100.00	100.00	100.00	0.00
100.00	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.00	40.00	60.00	5.00	30.00	7.00	70.00	25.00	55.00	21.00

88.00	89.00	90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.00
0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00	0.00	0.00
0.00	65.00	25.00	40.00	0.00	0.00	40.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	35.00
10.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	30.00	10.00	0.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	65.00	25.00	40.00	35.00	0.00	40.00	0.00	0.00	0.00
10.00	1.00	1.00	30.00	10.00	20.00	1.00	7.00	35.00	35.00
15.00	84.00	24.00	60.00	60.00	20.00	89.00	20.00	30.00	10.00
65.00	10.00	25.00	5.00	10.00	35.00	5.00	60.00	25.00	10.00
10.00	5.00	50.00	5.00	20.00	25.00	5.00	13.00	10.00	45.00
100.00	0.00	0.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	66.00	26.00	70.00	45.00	20.00	41.00	7.00	35.00	35.00

98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00
0.00	15.00	15.00	0.00	0.00	70.00	40.00	0.00	0.00	50.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	0.00	0.00	40.00	0.00	0.00	0.00	5.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
35.00	15.00	15.00	0.00	0.00	70.00	40.00	0.00	0.00	50.00
35.00	1.00	5.00	40.00	5.00	1.00	5.00	5.00	15.00	1.00
15.00	84.00	15.00	20.00	10.00	89.00	60.00	25.00	55.00	74.00
40.00	10.00	60.00	35.00	60.00	5.00	15.00	50.00	20.00	20.00
10.00	5.00	20.00	5.00	25.00	5.00	20.00	25.00	10.00	5.00
100.00	0.00	100.00	100.00	0.00	0.00	0.00	100.00	100.00	0.00
0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	16.00	20.00	40.00	5.00	71.00	45.00	5.00	15.00	51.00

108.00	109.00	110.00	111.00	112.00	113.00	114.00	115.00	116.00	117.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	35.00	0.00
0.00	20.00	0.00	0.00	50.00	25.00	0.00	0.00	0.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	30.00	10.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00
35.00	20.00	0.00	0.00	50.00	25.00	0.00	40.00	35.00	35.00
35.00	20.00	10.00	5.00	1.00	35.00	10.00	30.00	20.00	35.00
55.00	25.00	10.00	10.00	89.00	30.00	25.00	60.00	55.00	55.00
5.00	45.00	70.00	60.00	5.00	25.00	35.00	5.00	10.00	5.00
5.00	10.00	10.00	25.00	5.00	10.00	30.00	5.00	15.00	5.00
100.00	100.00	50.00	0.00	0.00	85.71	100.00	100.00	100.00	100.00
0.00	0.00	0.00	100.00	0.00	14.29	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	40.00	10.00	5.00	51.00	60.00	10.00	70.00	55.00	70.00

118.00	119.00	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00
50.00	0.00	25.00	25.00	0.00	0.00	0.00	60.00	30.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	5.00	0.00	0.00	25.00	0.00	10.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
50.00	0.00	25.00	25.00	0.00	0.00	0.00	60.00	30.00	35.00
5.00	5.00	5.00	1.00	10.00	25.00	5.00	10.00	10.00	1.00
80.00	20.00	85.00	24.00	85.00	15.00	30.00	30.00	20.00	25.00
10.00	15.00	5.00	70.00	4.00	15.00	20.00	55.00	40.00	49.00
5.00	60.00	5.00	5.00	1.00	45.00	45.00	5.00	30.00	25.00
100.00	100.00	100.00	0.00	100.00	100.00	0.00	100.00	100.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55.00	5.00	30.00	26.00	10.00	25.00	5.00	70.00	40.00	36.00

128.00	129.00	130.00	131.00	132.00	133.00	134.00	135.00	136.00	137.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	35.00	0.00	0.00	15.00	7.00	5.00	0.00	0.00	0.00
0.00	0.00	20.00	45.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
15.00	15.00	0.00	0.00	20.00	0.00	0.00	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	35.00	0.00	0.00	15.00	7.00	5.00	0.00	0.00	0.00
15.00	15.00	20.00	45.00	20.00	1.00	1.00	15.00	5.00	5.00
25.00	50.00	10.00	20.00	15.00	10.00	24.00	25.00	5.00	10.00
35.00	10.00	20.00	5.00	5.00	15.00	50.00	35.00	15.00	60.00
25.00	25.00	50.00	30.00	60.00	74.00	25.00	25.00	75.00	25.00
100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	100.00
0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	50.00	20.00	45.00	35.00	8.00	6.00	15.00	5.00	5.00

ENERGY WEST MINING
CTW Reference Area
Cottonwood Mine Old Waste Rock
Exposure: E
Slope: 1 - 5 deg.
Sample Date: 10-12 Aug 2006

138.00	139.00	140.00	Mean	SDev	Freq	
						OVERSTORY
0.00	0.00	0.00	8.50	15.72	28.57	*Juniperus osteosperma*
40.00	50.00	0.00	8.23	15.21	26.43	*Pinus edulis*
						UNDERSTORY
						SHRUBS
0.00	0.00	0.00	1.44	6.80	5.71	*Cercocarpus montanus*
10.00	10.00	25.00	2.79	8.66	12.86	*Ephedra viridis*
0.00	0.00	0.00	0.05	0.59	0.71	*Gutierrezia sarothrae*
0.00	0.00	0.00	4.36	10.07	20.00	*Juniperus osteosperma*
0.00	0.00	0.00	0.19	0.94	4.29	*Opuntia polyacantha*
20.00	10.00	0.00	8.07	13.21	35.71	*Pinus edulis*
0.00	0.00	0.00	0.08	0.85	1.43	*Yucca harrimaniae*
						FORBS
0.00	0.00	0.00	0.39	1.27	9.29	*Eriogonum bicolor*
0.00	0.00	0.00	0.39	1.31	9.29	Euphorbia fendleri
						GRASSES
						COVER
40.00	50.00	0.00	16.73	18.55		Overstory
30.00	20.00	25.00	17.94	15.85		Understory
65.00	25.00	20.00	33.27	23.47		Litter
4.00	30.00	35.00	25.55	19.74		Bareground
1.00	25.00	20.00	23.45	18.92		Rock
						% COMPOSITION
100.00	100.00	100.00	71.95	44.30		Shrubs
0.00	0.00	0.00	15.98	35.89		Forbs
0.00	0.00	0.00	0.00	0.00		Grasses
70.00	70.00	25.00	34.67	23.62		Overstory + Understory

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 9
Demonstration that Area is Not Contributing Suspended Solids Outside Permit Area

Demonstration that Area is Not Contributing Suspended Solids Outside Permit Area (Refer to Phase III Bond Release map for information concerning this demonstration)

The Cottonwood/Wilberg "old" waste rock site area (BLM right of way UTU-37642) is approximately 34.56 acres. The lease area is divided into a northern and southern parcel, separated by a gravel road which provides access to a coal bed methane well pad (well # 35-14). The northern parcel encompasses 16.11 acres of undisturbed land. The southern parcel encompasses 18.45 acres of mostly disturbed land. A 1.81 acre boulder and soil storage area is located within the northwest corner of the southern parcel. This material will be used for reclamation purposes of the Cottonwood/Wilberg mine site. The remaining disturbed area, 13.81 acres, is subject to the Phase II and III Bond Release application.

As part of the reclamation of the 13.81 acre site, berms were constructed along the outside perimeter and seeded (see photo illustration this attachment). This perimeter berm impounds surface runoff, keeping the water on-site. All impounded water infiltrates the top of the waste rock site providing substantial moisture for vegetation growth. The have been no indications of failure of this system, therefore, no suspended solids are contributed outside the permit boundary from the top of the reclaimed area.

The only other area that may contribute sediment to outside areas is the 0.93 acre outslope surface area of the berms. These areas are considered to have the potential to contribute suspended solids to areas outside the permit area. Even though significant vegetation growth has occurred throughout the responsibility period, a demonstration has been provided utilizing the Revised Universal Soil Loss Equation (RUSLE) comparing the berm outslope to the reference area for soil loss. RUSLE2 is used to estimate soil loss, sediment yield, and sediment characteristics from rill and interrill erosion caused by rainfall and its associated overland flows. RUSLE2 uses factors that represent the effects of climatic erosivity, soil erodibility, topography, cover management and support practices to compute erosion (RUSLE2 Users Manual).

Climate and soil data were collected from database files provided by the Natural Resource Conservation Service (NRCS). The NRCS was also used to determine the soil type of the area. The NRCS Web Soil Survey was used to gather this information (see climate and soil data included with this attachment). Topographic data was gathered from existing as-built maps (refer to transect lines on Phase III Bond Release map in Attachment 4). Vegetation data was utilized from the Year 2 Vegetation Monitoring of the Cottonwood Mine Waste Rock Site report (see raw cover data in Attachment 8) conducted by Mt. Nebo Scientific in 2006.

Two transects were developed for running the RUSLE computations. One transect was established on Berm 4, the other on the Reference Area site. RUSLE computed the soil loss from each site using a unit output of soil loss in tons/acre/year (t/ac/yr). The soil loss from Berm 4 was estimated at 0.12 t/ac/yr. This compares fairly well with the Reference Area which had a soil loss estimate of 0.086 t/ac/yr. Refer to RUSLE2 Profile Erosion Calculation Record included with this attachment.

It is therefore concluded that the soil loss from the berm area is insignificant when compared to the surrounding area as a whole. It is believed that the inconsequential elevated soil loss estimated from the berm area is due to its steeper slope; 50% compared to 12% in the Reference Area. The 0.93 acres of berm outslope was estimated to contribute 223 lbs. of sediment per year. Utilizing an equivalent area, the Reference Area was estimate to contribute 160 lbs of sediment per year.

Phase II and III Bond Release Application – Attachment 9

Photo 1: Berm #3 (east berm reclaimed 1985) – Surface runoff from waste rock site not able to flow over berm.

Photo 2: Cell #7 (west berm reclaimed 1993) – Surface runoff from waste rock site not able to flow over berm.

Photo 3: Cell #7 (south berm reclaimed 1993) – Surface runoff from waste rock site not able to flow over berm.

Photo 4: Outslope of south end Cottonwood/Wilberg waste rock site. Berm outslopes were developed on the south, east, and west sides of the waste rock site. Total area is equal to 0.93 acres.

RUSLE2 Profile Erosion Calculation Record

Info: Soil Info from NRCS Web Soil Survey

File: profiles\ctw_wrs Reclaim Berm 4

Inputs:
Location: Emery County\UT_Emery_R_10
Soil: C113 Yatne very stony fine sandy loam, 3 to 20 percent slopes\ctw-wrs berm slope
Horiz. overland flow path length: 50.0 ft
Avg. slope steepness: 50 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
ctw_wrs reclaim slope	ctw-wrs berm slope	lbs/ac	950

Contouring: c. perfect contouring no row grade
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss erod. portion: 0.12 t/ac/yr
Detachment on slope: 0.12 t/ac/yr
Soil loss for cons. plan: 0.12 t/ac/yr
Sediment delivery: 0.12 t/ac/yr

Crit. slope length: 50.0 ft
Surf. cover after planting: 0 %

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
9/15/0	Graze, continuous	ctw-wrs berm slope	0

RUSLE2 Profile Erosion Calculation Record

Info: Soil Info from NRCS Web Soil Survey

File: profiles\ctw_wrs Reference Area

Inputs:
Location: Emery County\UT_Emery_R_10
Soil: C113 Yatne very stony fine sandy loam, 3 to 20 percent slopes\ctw-wrs reference area
Horiz. overland flow path length: 100 ft
Avg. slope steepness: 12 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
ctwwrs-ref	ctw-wrs reference area veg	Bushels	500

Contouring: default
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss erod. portion: 0.086 t/ac/yr
Detachment on slope: 0.086 t/ac/yr
Soil loss for cons. plan: 0.086 t/ac/yr
Sediment delivery: 0.086 t/ac/yr

Crit. slope length:
Surf. cover after planting: 0 %

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
9/15/0	Graze, continuous	ctw-wrs reference area veg	0

Climate Data used in RUSLE

RUSLE2 ARS Version Jul 11 2007 - [Climate: USA\Utah\Emery County\UT_Emery_R_10]

File Database Edit View Options Window Help

Auto update

How get erosivity distribution? From monthly eros. density & precip.

R Factor, US 10.9

Standard EI distribution

In Req area? No

Use frozen/thawing soil routines?

R factor, US

EI dist. for Req conditions

How determine runoff? based on 10-yr 24-hr ppt

10-yr 24-hr rainfall, in. 1.7

10 year EI, US 8.73

Annual precip, in. 10

Monthly | Daily | Info

Monthly Climate

Month	Avg. temp., deg F	Month precip., in.	R values, US	Eros. density, US eros. / in. ppt
Jan	26.4	0.743	0.16	0.209
Feb	32.3	0.601	0.16	0.269
Mar	39.6	0.968	0.36	0.373
Apr	47.5	0.616	0.35	0.567
May	57.0	0.781	0.86	1.10
Jun	66.9	0.527	0.67	1.66
Jul	73.7	1.09	2.8	2.57
Aug	71.5	1.20	2.2	1.85
Sep	62.9	1.37	1.8	1.30
Oct	51.5	1.02	0.79	0.776
Nov	37.2	0.592	0.32	0.537
Dec	27.9	0.741	0.19	0.254

Finished calculating

R2_ARS | ARS basic uniform slope | moses

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Area of Interest (AOI) | Soil Map | Soil Data Explorer | Shopping Cart

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Map Unit Legend

Legend

Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
C113	Yatne very stony fine sandy loam, 3 to 20 percent slopes	77.8	100.0%
Totals for Area of Interest (AOI)		**77.8**	**100.0%**

Soil Map

Scale (not to scale)

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Soils data used in RUSLE

RUSLE2 ARS Version Jul 11 2007 - [Soil: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties\C113 Yabne very stony fine sandy loam, 3 to 20 p]

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Auto update

Graphic

Rock cover, % 0

How get soil erodibility? set by user

Erodibility, US 0.28

Calc. consolidation from precip? No

Nominal consolidation time, yr 7.0

Texture Sandy loam

Clay (<0.002 mm), % 15

Silt (0.002-0.05 mm), % 16

Sand (0.05-2 mm), % 69

T value, t/ac/yr 5.0

Hydrologic class B - mod. low runoff

Hydrologic class with subsurface drainage B - mod. low runoff

Info | Detached particles

Spec. surf. area, ft2/oz 3300

Detached Particle Info

Type	Portion, %	Diameter, in	Fall velocity, mph	Specific gravity
clay	3.9	0.000079	0.0000069	2.6
silt	0.96	0.00039	0.00018	2.7
sand	31	0.0075	0.052	2.7
small agg.	15	0.0012	0.00095	1.8
large agg.	49	0.012	0.041	1.6

Finished calculating

R2_ARS | ARS basic uniform slope | moses

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Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 10
Demonstration that Responsibility Period has been Met

Demonstration that Responsibility Period has been Met

As stated in the Utah Coal Regulations, R645-301-357 Revegetation: Extended Responsibility Period:

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

As shown on the enclosed map in Attachment 4, the last year of augmented seeding, fertilization, irrigation, or other work occurred in 1993 in Cell 7. All other cells were seeded and fertilized between the years 1983 and 1993.

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

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

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

Meteorological weather data has been collected by PacifiCorp since 1980 (refer to Annual Report.) This data indicates that the 26 year average annual precipitation for the East Mountain area, which includes the Cottonwood/Wilberg Mine Site, is 12.9 inches. Since this amount is less than 25 inches, SMCRA specifies that the responsibility period [for Energy West mines] will be ten full years. The ten year responsibility period was completed in full for the Cottonwood/Wilberg "old" waste rock site in 2003. Vegetation monitoring for Phase II and III bond release occurred in 2005 and 2006.

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 11
Demonstration that Post Mining Land Use has been Achieved

Demonstration that Post Mining Land Use has been Met

Land use for the Wilberg Mine was established in the early 1980's as grazing and wildlife. Land use information is found in Volume 2, Part 2, starting on page 175 of the mining and reclamation plan. The plan states for the Cottonwood/Wilberg "old"waste rock site, "...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)."

This 1982 letter from the BLM reported that Section 34 comprised of 640 acres and a carrying capacity of 9.7 AUM's. Section 35 comprised of 640 acres and a carrying capacity of 18.2 AUM's. This equates to 0.015 AUM/ac for Section 34 and 0.028 AUM/ac for Section 35 or an average of 0.022 AUM/ac.

The combined cells and berms area production was estimated by Mt. Nebo Scientific at 1350 lbs/ac. Converting this figure to establish equivalent units as above (AUM/ac), we find that;

$$1350\frac{lbs}{ac}x0.3(harvest\ efficency) \approx 450\frac{lbs}{ac}$$

$$\frac{450\frac{lbs}{ac}}{790\frac{lbs}{AUM}} = 0.51\frac{AUM}{ac}$$

If wildlife consumes approximately ½ of the available forage, there would still be approximately 0.26 AUM/ac for cattle. The use for grazing has been met.

A letter dated August 2, 1982 from the Soil Conservation Service (now known as Natural Resource Conservation Service) stated that the original 48.62 acre site had a forage production capacity of 700 lbs/ac. It also stated that the site condition was in fair condition. The 2006 vegetation survey found production at 1350 lbs/ac for the reclaimed area and 450 lbs/ac for the reference area. This comparison suggests that even though the reclaimed area has a higher production capacity than pre-mining conditions, the reference area still struggles from the recent drought.

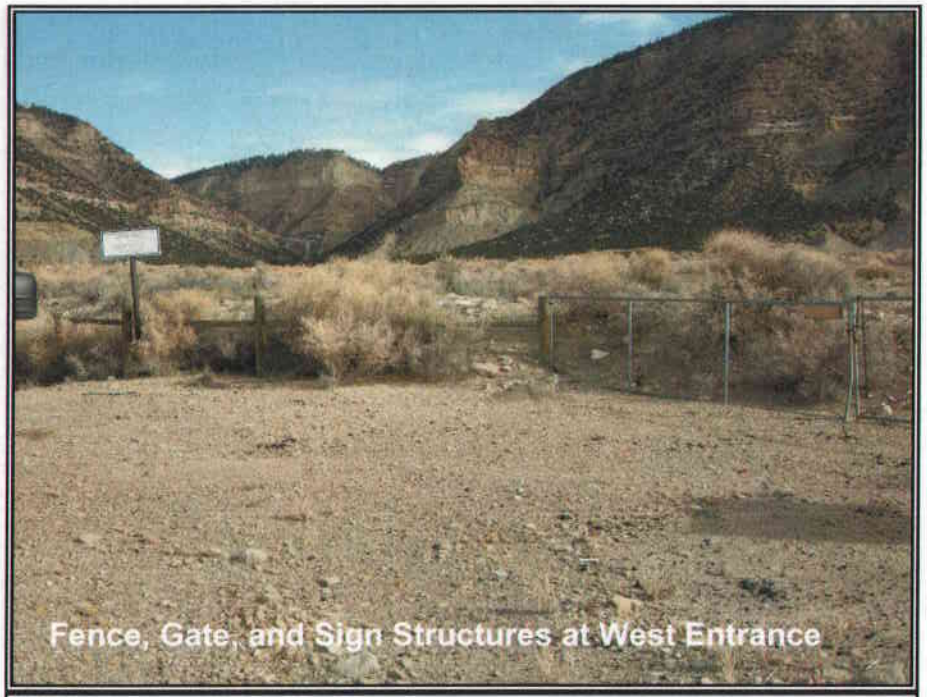
To conclude, the above demonstration shows that the post-mining conditions of the land exceed the pre-mining conditions. The reclaimed land of the waste rock site should support the uses that were placed on this parcel of land. The land uses for grazing and wildlife have been as demonstrated by a successful vegetative stand in that area.

Application for Phase II and III Bond Release
Cottonwood/Wilberg "Old" Waste Rock Site

Attachment 12
Remaining Structures to be Removed

Structures remaining to be removed are included in the following five photos. Structures include fences, gate, signs, silt fence, and vegetation monitoring enclosures.

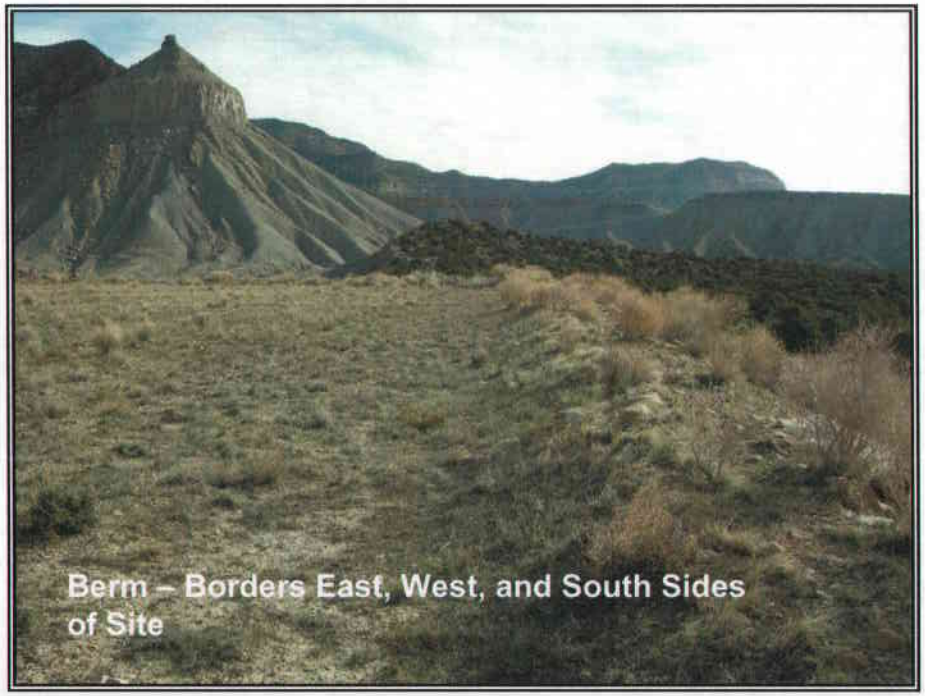
Attachment 12



Fence, Gate, and Sign Structures at West Entrance

Fence Structure on East Side of Site

Silt Fence Structure on East Side of Site



Note: Berm is shown for illustrative purposes only. The berm will remain as part of final reclamation.