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Annual Report

This Annual Report shows information the Division has for your mine. Submit the completed document and any additional information identified in the Appendices to the Division by the date specified in the cover letter. During a complete inspection an inspector will check and verify the information.

GENERAL INFORMATION

Company Name	Plateau Mining, LLC	Mine Name	Willow Creek Mine
Permit Number	C/007/0038	Permit expiration Date	
Operator Name	Plateau Mining, LLC	Phone Number	
Mailing Address	P.O. Box 592	Email	
City	Orangeville		
State	Utah	Zip Code	84537

		DOGM File Location or Annual Report Location
Excess Spoil Piles	☐ Required ☒ Not Required	
Refuse Piles	☐ Required ☒ Not Required	
Impoundments	☐ Required ☒ Not Required	
Other:		

OPERATOR COMMENTS

REVIEWER COMMENTS ☐ Met Requirements ☐ Did Not meet Requirements

COMMITMENTS AND CONDITIONS

The Permittee is responsible for ensuring annual technical commitments in the Mining and Reclamation Plan and conditions accepted with the permit are completed throughout the year. The Division has identified these commitments below and has provided space for you to report what you have done during the past year for each commitment. If additional written response is required, it should be filed as an attachment to this report.

Title: CRANDALL CANYON SHAFT SETTLEMENT MONITORING
Objective: Perform Annual Shaft Settlement Surveys on Two Reclaimed Shafts in Crandall Canyon
Frequency: Annually, Beginning after the approval of phase II bond release until phase III bond release.
Status: Ongoing
Reports: Annual
Citation: MRP, Volume 17, Exhibit 24, Appendix 8

Operator Comments

The Annual Shaft Settlement Survey for the Eastern Shaft is attached. The Western Shaft received Phase III Bond Release in 2015.

Reviewer Comments ☐ Met Requirements ☐ Did Not Meet Requirements

REPORTING OF OTHER TECHNICAL DATA

Please list other technical data or information that was not included in the form above, but is required under the approved plan, which must be periodically submitted to the Division.

Please list attachments:

Vegetation Monitoring for Phase III Bond Release: Sediment Pond and Shaft Area in Crandall Canyon. (Year 9 Veg. Study)

Reviewer Comments

MAPS

Copies of mine maps, current and up-to-date, are to be provided to the Division as an attachment to this report in accordance with the requirements of R645-301-525.240. The map copies shall be made in accordance with 30 CFR 75.1200 as required by MSHA. Mine maps are not considered confidential.

Map Name	Map Number	Included		Confidential	
		Yes	No	Yes	No
		☐	☐	☐	☐
		☐	☐	☐	☐
		☐	☐	☐	☐
		☐	☐	☐	☐
		☐	☐	☐	☐

Reviewer Comments ☐ Met Requirements ☐ Did Not Meet Requirements

VEGETATION MONITORING FOR PHASE III BOND RELEASE: SEDIMENT POND & SHAFT AREA IN CRANDALL CANYON, UTAH

YEAR ONE

2017

FOR
PLATEAU MINING, LLC

Reclaimed Area in Crandall Canyon

Prepared by

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for
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P.O. Box 592
Orangeville, Utah 84537

January 2018

TABLE OF CONTENTS

INTRODUCTION 1

History 1

METHODS 2

Transect and Quadrat Placement 2
Cover, Frequency and Composition 2
Sample Size and Adequacy 2
Diversity 3
Photographs 3

RESULTS 4

Reclaimed Shaft and Sediment Pond Area 4
Crandall Canyon Reference Area 4
Dataset Comparisons 5
Total Living Cover 5
Woody Species Density 6
Annual Production 7
Diversity 8

SUMMARY & DISCUSSION 9

DATA SUMMARY TABLES 9

COLOR PHOTOGRAPHS OF THE STUDY AREAS 14

MAP OF WILLOW CREEK MINE PERMIT AREA . . . . . Attachment

INTRODUCTION

History

The Willow Creek Mine is located in Price Canyon about 3.5 miles northwest of the town of Helper, Utah (see attached map). The mine ceased coal mining operations in 2000. By 2004, reclamation and revegetation activities were completed at the mine site. This reclamation included the following areas: Gravel Canyon, Refuse Pile, Conveyor Corridor, Loadout, Riparian Bottoms and Crandall Canyon.

In order to conduct coal mining activities in Utah, reclamation bonds are required beforehand and are held through the State of Utah, Division of Oil, Gas and Mining (DOGM). Land operators of reclaimed mines can apply for *Final* or *Phase III Bond Release* when the restored vegetation has been quantitatively sampled for 2 consecutive years beginning 9 years after final reclamation activities have been completed. This time-frame is called the *Responsibility Period*. This duration is considered to be enough time for restored vegetation to become adequately established to judge whether or not it is permanent, diverse and self-sustaining. In order to achieve approval for bond release, vegetation of a reclaimed site must meet specific standards for revegetation success.

As a result of quantitative sampling the revegetated sites in 2013 and 2014, Phase III Bond Release applications were submitted and approved for most of the sites mentioned above. There was one small area in Crandall Canyon (see attached map) however where final bond release was not granted because in November 2006 it was discovered that the return air shaft here, which was backfilled in 2003, had settled significantly and water had entered the shaft from a horizon estimated to be within the top 100 feet of the shaft opening. In 2007 DOGM authorized the permittee to excavate a temporary holding and evaporation pond to hold the water that had accumulated in the shaft. A pond was constructed directly to the west of the shaft and the water from the shaft was placed into this pond for settlement and evaporation. This project necessitated re-disturbance of 1.19 acres of land that had been originally reclaimed in 2003. By July 2008, the water placed in this temporary holding pond had completely evaporated and the final reclamation and re-seeding of this area was

completed. Consequently, the Responsibility Period's "bond clock" for bond released of the Sediment Pond and Shaft Area was re-adjusted.

This document contains the **Year One** results of the two sample years required by the state for bond release at the sediment pond and shaft area in Crandall Canyon for the Willow Creek Mine in Carbon County, Utah.

METHODS

Methodologies used for sampling were performed in accordance with the *Vegetation Information Guidelines* provided by DOGM.

Transect and Quadrat Placement

Random placement of sample quadrats were designed as an attempt to provide unbiased accuracy of the data compiled. This was accomplished by establishing several randomly-placed transect lines along the entire length of each study site. Random numbers were generated and used to determine placement from the transect lines. The random numbers selected were high enough to position sample quadrats to the extreme lateral limits of the study areas and low enough to cover all areas in-between. This insured that the sample quadrats were placed randomly over the entire study areas.

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. Plant nomenclature follows *A Utah Flora* (Welsh et al. 2008).

Sample Size and Adequacy

Sampling adequacy was calculated using the formula given below.

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

where,

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

Diversity

There are several well-documented methods to assess species diversity in plant communities. The diversity index that was employed to compare the reclaimed and reference areas here was the *MacArthur's Diversity Index* and was calculated by the following equation:

$$1/\sum pi^2$$

where,

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.

Photographs

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

RESULTS

Reclaimed Shaft and Sediment Pond Area

This reclaimed area was dominated by shrub species such as sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Chrysothamnus nauseosus)* and curl-leaf mountain-mahogany (*Cercocarpus ledifolius*). The dominant grasses here were Gt. Basin wildrye (*Elymus cinereus*), Kentucky bluegrass (*Poa pratensis*), bluebunch wheatgrass (*Elymus spicatus*), western wheatgrass (*E. smithii*) and thick-stem wheatgrass (*E. lanceolatus*). The most important forb species by quite a wide margin was Pacific aster (*Aster chilensis*) . For a list of all species encountered in the sample quadrats refer to Table 1.

The total living cover of the reclaimed Sediment Pond and Shaft Area was estimated at 62.42% (Table 2-A). This living cover was comprised of 46.81% grasses. 33.64% shrubs and 19.55% forbs (Table 2-B). Total woody species density in the area was 4,836 individuals per acre and was dominated by sagebrush, rubber rabbitbrush and curl-leaf mountain mahogany (Table 3). Annual production at the site was measured at 1,314.70 pounds per acre with nearly equal proportions of herbaceous and woody plant species (Table 4).

Reference Area

A "reference area" or an area previously chosen to represent final revegetation success standards was sampled during the same time period. Sample results show that the dominant species for the reference area included salina wildrye (*Elymus salinus*), cheatgrass (*Bromus tectorum*) and sagebrush (Table 5).

The total living cover was estimated at 51.80% (Table 6A). Composition was comprised of grasses at 68.74%, shrubs at 27.32% and forbs at 3.95%. (Table 6B).

The total number of woody plants for the reference area was 1,316 individuals per acre, most of which was sagebrush (Table 7). Annual production here was estimated at a total of 715.65 pounds per acre, and was comprised of nearly equal parts of herbaceous and woody

plant species (Table 8).

Dataset Comparisons

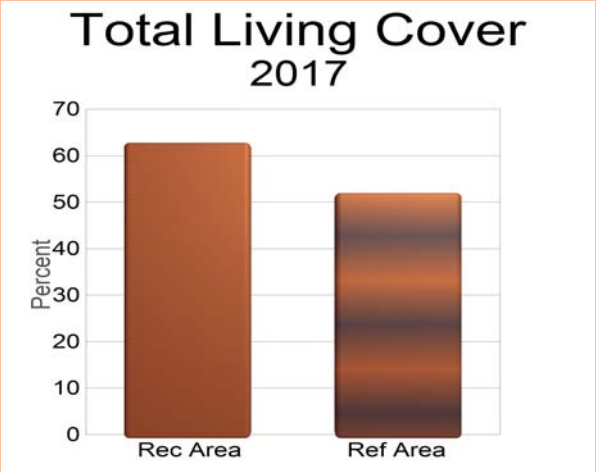
Total Living Cover

When a Student's t-test was employed to compare the total living cover of the reclaimed Sediment Pond and Shaft Area with the Crandall Canyon Reference Area the reclaimed site was significantly higher - the difference was statistically significant (Fig. 1).

FIG. 1. STUDENT'S T-TEST - A Total Living Cover Comparison Between the Reclaimed and Reference Areas.

Crandall Canyon
Reclaimed Area: $\bar{x}$=62.42; s=10.10; n=60
Reference Area: $\bar{x}$=51.80; s=13.85; n=50
t =4.642 df =108 ; SL= p<0.001

```
x̄= sample mean,
s = sample standard deviation,
n = sample size,
NS = non-significant,
t = Student's t-value,
df = degrees of freedom,
SL = significance level,
p = probability level
```



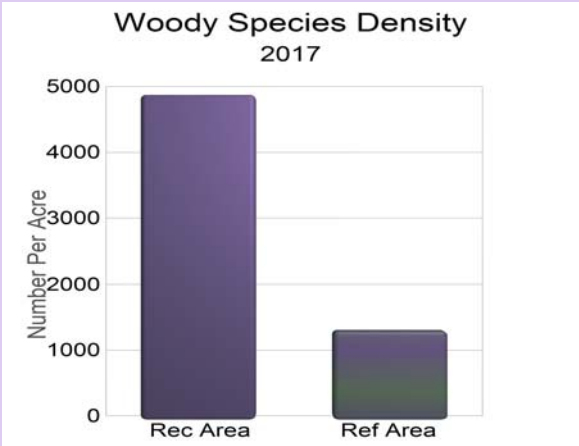
Woody Species Density

The total woody species densities of the reclaimed and reference area were compared using the same statistical test. The reclaimed area had significantly more individuals per acre when compared to the reference area (Fig. 2).

FIG. 2. STUDENT'S T-TEST - A Woody Species Density Comparison Between the Reclaimed and Reference Areas.

Crandall Canyon
Reclaimed Area: $\bar{x}$=4836.44; s=2135.28; n=60
Reference Area: $\bar{x}$=1315.75; s=842.47; n=50
t =10.963 df =108 ; SL= p<0.001

```
x̄= sample mean,
s = sample standard deviation,
n = sample size,
NS = non-significant,
t = Student's t-value,
df = degrees of freedom,
SL = significance level,
p = probability level
```



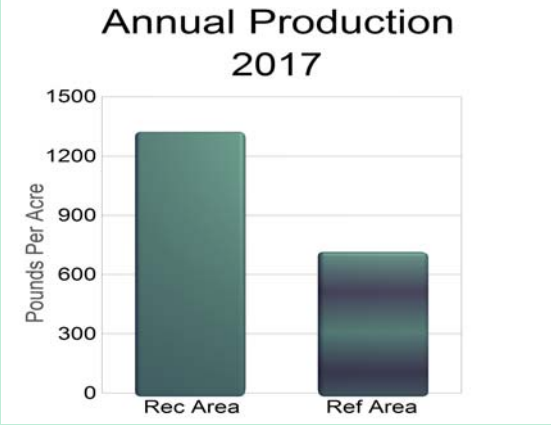
Annual Production

Total annual production of the two areas were then compared. Once again, the reclaimed Sediment Pond and Shaft Area had a statistical significant greater amount of production when compared to the Crandall Canyon Reference Area (Fig. 3).

FIG. 3. STUDENT'S T-TEST - A Total Annual Production Comparison Between the Reclaimed and Reference Areas.

Crandall Canyon
Reclaimed Area: $\bar{x}$=1314.70; s=483.36; n=30
Reference Area: $\bar{x}$=715.65; s=235.94; n=50
t =7.432 df =78 ; SL= p<.001

```
x̄= sample mean,
s = sample standard deviation,
n = sample size,
NS = non-significant,
t = Student's t-value,
df = degrees of freedom,
SL = significance level,
p = probability level
```



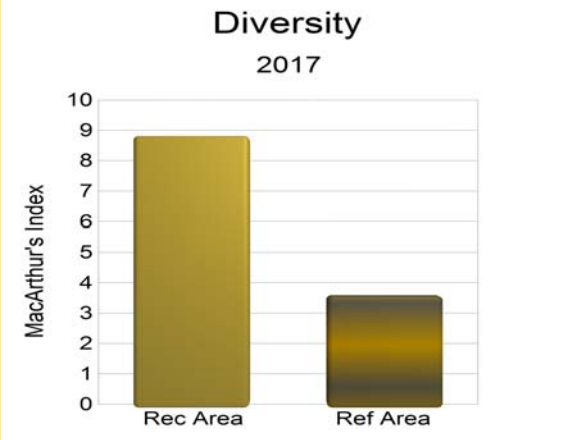
Diversity

Finally, species diversity was greater in the reclaimed area when compared to the reference area when MacArthur's Index was used on the dataset of each area (Fig. 4.).

FIG. 4. MacARTHUR'S INDEX - A Comparison Between the Reclaimed and Reference Areas.

$$1/\sum pi^2 =$$

Crandall Canyon
Reclaimed Area: 8.761
Reference Area: 3.603



SUMMARY & DISCUSSION

A relatively small area (1.19 acres) in the Crandall Canyon of the Willow Creek Mine site called the Sediment Pond and Shaft Area was re-disturbed in 2008, or four years after reclamation in the area had occurred. Most of the remainder of the reclaimed mine sites achieved Phase III or Final Bond Release, but the new disturbance in Crandall Canyon required the bond clock for final bond release to be re-adjusted.

In 2017 quantitative sampling was conducted at the Sediment Pond and Shaft Area to begin the first of two consecutive sample years required for final bond release. Comparisons between the datasets for the restored vegetation in Crandall Canyon and the area chosen to represent final revegetation success standards, the Crandall Canyon Reference Area, were made and presented in this report. When **total living cover** of the two areas were compared, the reclaimed area was greater, the difference being statistically significant. Next, the **woody species densities** of the datasets were compared – the results were the same - the reclaimed area had significantly more individuals per acre. The **annual production** of the reclaimed site was also greater in the reference area. Finally, the **diversity** of the reclaimed area was compared to the reference area using MacArthur's Index and the reclaimed area had greater species diversity.

For Year One of the two required sample years, it appears that when above parameters of the reclaimed Sediment Pond and Shaft Area and Crandall Canyon Reference Area were compared, the reclaimed area is approaching the requirements necessary for *Phase III Bond Release*. Vegetation sampling for Year Two should be accomplished in 2018 for comparisons and to fulfil the required datasets for an application to achieve final bond release.

DATA SUMMARY TABLES

Table 1: Willow Creek Mine, Crandall Canyon. Total cover, standard deviation and frequency by species (2017).

Reclaimed Sediment Pond and Shaft Area n=60

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia tridentata	11.50	11.77	61.67
Cercocarpus ledifolius	3.33	8.50	20.00
Chrysothamnus nauseosus	5.83	10.25	33.33
Pseudotsuga menziesii	0.25	1.42	3.33
Symphoricarpos oreophilus	0.33	2.56	1.67
FORBS			
Achillea millefolium	0.75	3.63	5.00
Artemisia ludoviciana	0.17	1.28	1.67
Aster chilensis	6.00	9.78	63.67
Grindelia squarrosa	1.00	4.06	6.67
Machaeranthera grindelioides	0.33	1.55	5.00
Melilotus officinalis	0.75	2.38	10.00
Penstemon palmeri	0.58	2.25	6.67
Penstemon sp	2.25	5.20	20.00
Viguiera multiflora	0.17	1.28	1.67
GRASSES			
Bromus carinatus	0.25	1.92	1.67
Elymus cinereus	8.75	12.17	43.33
Elymus junceus	0.58	3.43	3.33
Elymus lanceolatus	2.92	5.79	23.33
Elymus smithii	3.00	7.37	16.67
Elymus spicatus	5.25	9.46	31.67
Poa pratensis	5.67	11.27	28.33
Poa secunda	1.25	6.10	5.00
Stipa hymenoides	1.50	6.73	5.00

Table 2: Willow Creek Mine, Crandall Canyon. Total Cover and composition (2017).

Reclaimed Sediment Pond and Shaft Area n=60

	Mean Percent	Standard Deviation
A. TOTAL COVER		
Total Living Cover	62.42	10.10
Litter	13.67	5.76
Bareground	9.42	4.57
Rock	14.50	8.50
B. COMPOSITION		
Shrubs	33.64	24.55
Forbs	19.55	16.97
Grasses	46.81	24.54

Table 3: Willow Creek Mine, Crandall Canyon. Woody Species Density (2017).

Reclaimed Sediment Pond and Shaft Area n=60

SPECIES	Number/Acre
Amelanchier utahensis	20.15
Artemisia tridentata	2901.86
Cercocarpus ledifolius	483.64
Chrysothamnus nauseosus	1350.17
Pseudotsuga menziesii	40.30
Ribes aureum	20.15
Symphoricarpos oreophilus	20.15
TOTAL	**4836.44**

Table 4: Willow Creek Mine, Crandall Canyon
Annual Biomass Production (2017).
Reclaimed Sediment Pond and Shaft Area

(n=30; double sampling n=120)

LIFEFORM	Pounds/Acre MEAN	STD. DEV.
Herbaceous	690.72	793.26
Woody	623.98	682.92
TOTAL	**1314.70**	**483.36**

Table 5: Willow Creek Mine, Price Canyon. Total cover, standard deviation and frequency by species (2017).

Crandall Canyon Reference Area n=50

	Mean Percent	Standard Deviation	Percent Frequency
TREES & SHRUBS			
Artemisia tridentata	12.10	15.10	48.00
Atriplex canescens	1.20	5.96	4.00
Gutierrezia sarothrae	0.60	4.20	2.00
FORBS			
Artemisia ludoviciana	1.70	3.82	20.00
Descurainia pinnata	0.20	1.40	2.00
GRASSES			
Bromus tectorum	12.60	10.55	76.00
Elymus salinus	22.90	14.36	88.00
Stipa comata	0.50	3.50	2.00

Table 6: Willow Creek Mine, Price Canyon. Total Cover and composition (2017).

Crandall Canyon Reference Area n=50

	Mean Percent	Standard Deviation
A. TOTAL COVER		
Total Living Cover	51.80	13.85
Litter	11.00	4.12
Bareground	8.70	4.78
Rock	28.50	13.90
B. COMPOSITION		
Shrubs	27.32	29.84
Forbs	3.95	7.92
Grasses	68.74	28.58

Table 7: Willow Creek Mine, Crandall Canyon.. Woody Species Density (2017).

Crandall Canyon Reference Area n=50

SPECIES	Number/Acre
Amelanchier utahensis	6.58
Artemisia tridentata	1085.49
Atriplex canescens	98.68
Gutierrezia sarothrae	98.68
Opuntia polyacantha	19.74
Rhus aromatica	6.58
TOTAL	**1315.75**

Table 8: Willow Creek Mine, Crandall Canyon
Annual Biomass Production (2017).
Crandall Canyon Reference Area

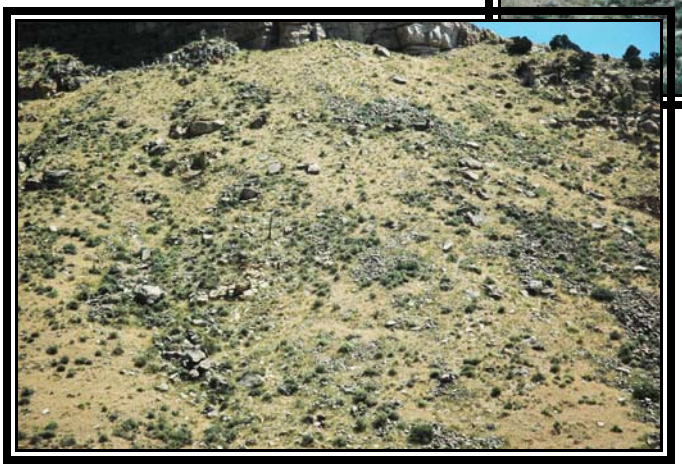
(n=50; double sampling n=200)

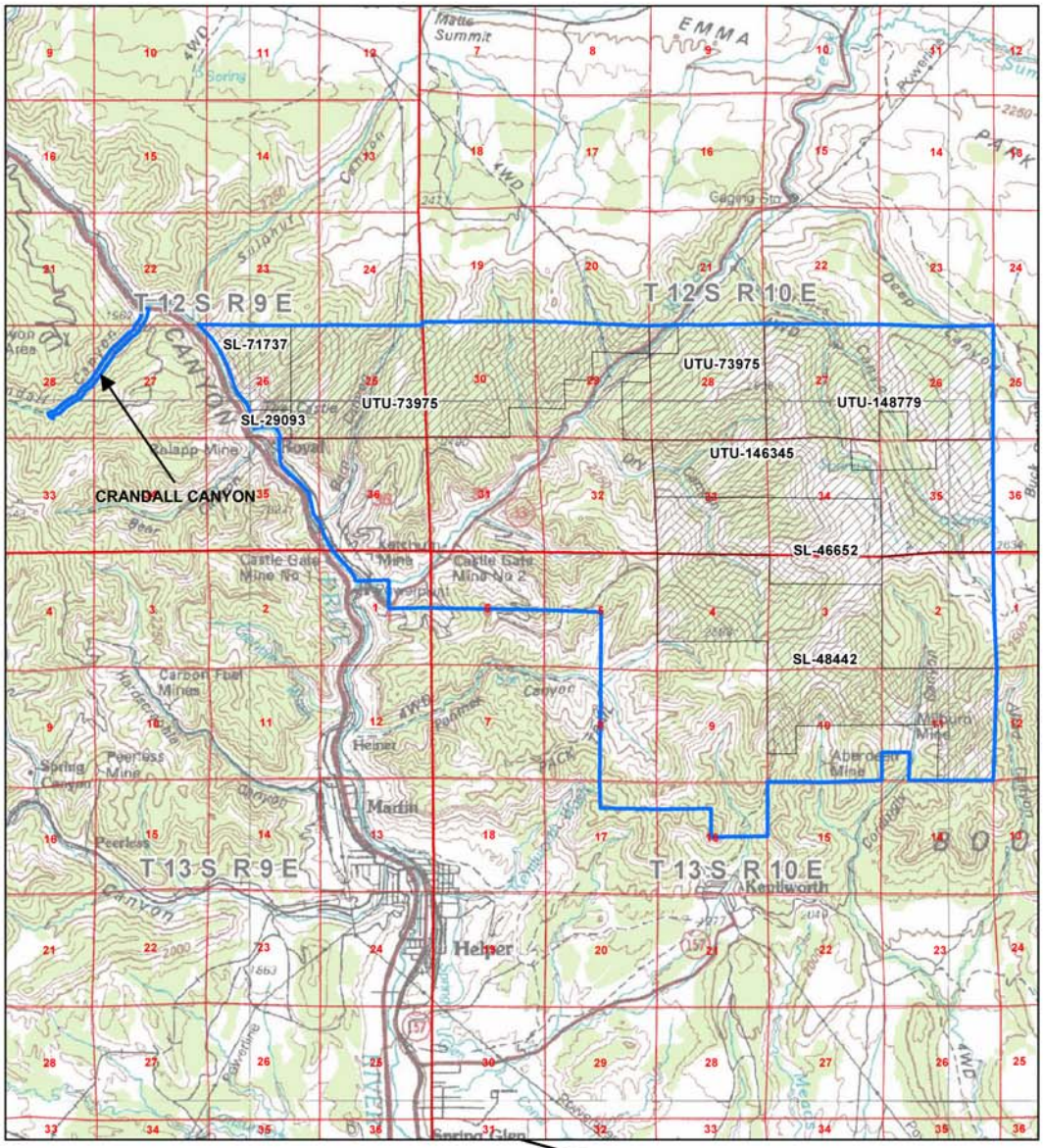
LIFEFORM	Pounds/Acre MEAN	STD. DEV.
Herbaceous	347.94	342.48
Woody	367.71	440.75
TOTAL	**715.65**	**235.94**

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS

Reclaimed Sediment Pond and Shaft Area

Crandall Canyon Reference Area





Willow Creek Mine

C0070038
Carbon County, Utah
January 2006
Crandall Canyon emphasized by Mt. Nebo Scientific, Inc. (1/11/18)
Township 12 South Range 9 & 10 East
Township 13 South Range 9 & 10 East

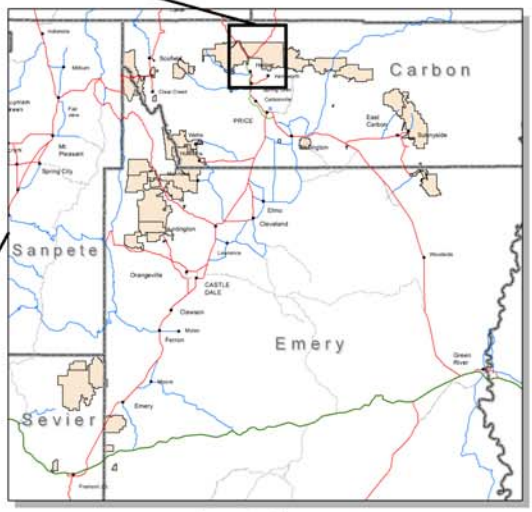
File: N:/gis/coal/coalareamaps/C0070038.pdf

Permit Area
Proposed Mine Plan Modification (If shown)
Federal Lease Areas

0 0.4 0.8 1.6 Miles

1:60,000

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining



Locator Map

PLATEAU MINING CORPORATION

CRANDALL CANYON RECLAMATION

EASTERN SHAFT SUBSIDENCE REPORT

11/29/2017

			2008 Surve	2009 Survey		2012 Survey		2013 Survey		2014 Survey		2015 Survey		2016 Survey		2017 Survey	
POINT NUMBER	**NORTHING (FEET)**	**EASTING (FEET)**	**ELEV (FEET)**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**	**ELEV (FEET)**	**ELEV DIFF.**
BENCHMARK	517056.3	2164798.1	6783.2	6783.2	0.0	6783.2	0.0	6783.2	0.0	6783.2	0.0	6783.2	0.0	6783.2	0.0	6783.2	0.0
Eastern Shaft Reclamation																	
1	516995.5	2165011.0	6784.1	6782.7	1.4	6781.3	1.4	6781.2	0.1	6781.2	0.1	6781.3	0.0	6781.2	0.1	6781.1	0.2
2	516991.9	2165017.9				6782.5		6782.5	0.0	6782.5	0.0	6782.5	0.0	6782.5	0.1	6782.4	0.1
3	516981.1	2165024.6				6780.4		6780.4	0.1	6780.4	0.1	6780.4	0.0	6780.3	0.1	6780.3	0.1
4	517008.3	2165033.6				6776.6		6776.6	0.1	6776.6	0.1	6776.6	0.0	6776.6	0.1	6776.5	0.1
5	516979.8	2164986.4				6776.5		6776.6	0.0	6776.6	0.0	6776.5	0.0	6776.5	0.0	6776.5	0.0
6	517019.4	2164994.1				6769.7		6769.6	0.1	6769.6	0.1	6769.7	0.0	6769.6	0.0	6769.5	0.2

WARE SURVEYING & ENGINEERING

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