

1998 Annual Report Review

Permittee: Canyon Fuel Company

Mine Name: SUFCO Mine

Permit Number: ACT/041/002

Date Report Received March 31, 1999

Assigned Reviewers: Paul Baker, Pete Hess, Mike Suflita

Instructions: The assigned staff will review their respective portions of the Annual report and provide a written determination (findings) on how the Mine has or has not met the permit requirements for reporting. If the report is deficient or remedial action is required to obtain compliance, this should be noted and the inspector notified. Once all reviewers have completed the report, they should initial it and a copy will be filed in the Mine folder #6.

Assignments: Inspectors: Review cover sheet, AVS legal/financial, Mine sequence map
Hydrologists: Review water monitoring data, Precipitation and climatological data, Non-coal waste
Biologists: Review vegetation/revegetation success monitoring, Raptor survey
Engineers: Review subsidence monitoring data, Annual impoundment certification, Annual overburden, spoils, refuse, floor, etc.

Section to review	Submitted Yes	No	Findings
Cover sheet	<u>X</u>	___	Cover sheet supplies requested information.
AVS; Legal/Financial Update	___	<u>X</u>	on file in SLO-DOGM. Ownership/Control changed 6/1/98
Mine Sequence Map	<u>X</u>	___	P.E. Certification by Wes Sorensen. Shows '98' mining & '99' projection. <u>OK</u>
Water Monitoring Data	___	<u>X</u>	Not in annual report, but already submitted quarterly. In database.
Precipitation & Climatological Data	<u>X</u>	___	
Non-Coal Waste report	___	<u>X</u>	Note says waiting on clarification from DOGM and USFS.
Subsidence monitoring data	<u>X</u>	___	Info in Appendix B Map1, Mine Subsidence Mp appears adequate. Map 1 P.E. certified by Wes Sorensen.

Annual Impoundment Certification	<u> </u> <u> X </u>	On File at SLO-DOGM. Reviewed during quarterly inspections.
Annual Overburden, Spoil, Refuse, Floor, etc.	<u> </u> <u> X </u>	On file at SLO-SOGM (Refuse Pile annual certifications) Reviewed during quarterly inspections.
Vegetation data	<u> </u> <u> X </u>	See below.
Revegetation Success monitoring	<u> X </u> <u> </u>	The report includes information about revegetation on the waste rock area and on test plots at the mine. All areas have done well according to the report with the greatest diversity coming in the pitted area of the waste rock site and on the test plot.
Raptor survey	<u> X </u> <u> </u>	The map submitted shows locations of raptor nests, and a separate key shows the activity status of each nest. No nests were undermined in 1998, and no nests would be undermined in 1999 according to the mine plan.
Other information	<u> </u> <u> </u>	

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Canyon Fuel Company, LLC
SUFCO Mine
397 South 800 West
Salina, Utah 84654
(435) 637-4880 Fax: (435) 636-4499

March 29, 1999

Ms. Mary Ann Wright
Utah Coal Regulatory Program
1594 West North Temple, Suite 1210
P. O. Box 145801
Salt Lake City, UT 84114-5801

Re: 1998 Annual Report for Canyon Fuel Company LLC, SUFCO Coal Mine
ACT/041/002, Sevier County, Utah

Dear Ms. Wright:

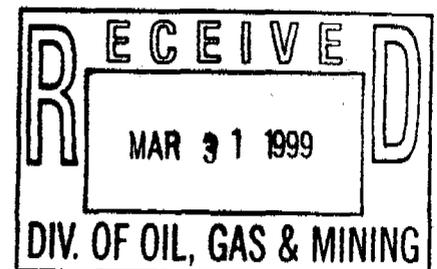
Enclosed herewith is a copy of the annual report for the Canyon Fuel Company, SUFCO Mine for 1998. The information included is thought to be complete as requested. Questions should be referred to Mike Davis at (435) 637-4880.

Sincerely,
CANYON FUEL COMPANY, LLC
SUFCO Mine

Kenneth E. May
Vice President and General Manager

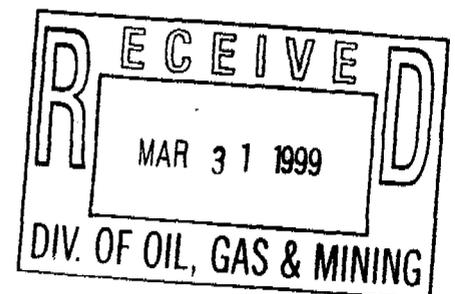
Enclosures

KEM/MLD:kb



1998 ANNUAL REPORT

**CANYON FUEL COMPANY, LLC
SUFCO MINE
ACT/041/002**



GENERAL INFORMATION

1. Permit Number	ACT/041/002
2. Mine Name	SUFCO Mine
3. Permittee Name	Canyon Fuel Company, LLC
4. Operator Name (if other than Permittee)	
5. Permit Expiration Date	May 20, 2002
6. Company Representative, Title	Kenneth E. May, General Manager
7. Phone Number	(435) 637-4880
8. Fax Number	(435) 636-4499
9. Mailing Address	Canyon Fuel Company, LLC SUFCO Mine 397 South 800 West Salina, UT 84654
10. Resident Agent, Title	CT Corporation Systems
Mailing Address	50 West Broadway Salt Lake City, Utah 84104

IDENTIFICATION OF OTHER PERMITS

Identify other permits which are required in conjunction with mining and reclamation activities.

Permit Type	ID Number	Description	Expires on
1. MSHA Mine ID(s)	4200089	Minesite	
	1211UT090 008901	Waste Rock Disposal Site	
2. MSHA Impoundment(s)			
3. NPDES/UPDES Permit(s) (water)	UT0022918	Minesite Sediment Pond Major Industrial	April 30, 2001
4. PSD (Air) Permit(s)	DAQE71498	Minesite Air Quality Approval Order	
	BAQE12688	Waste Rock Disposal Air Quality Approval Order	
5.			

CERTIFIED REPORTS

List the certified inspection reports as required by the rules and under the approved plan which must be periodically submitted to the Division. Specify whether the information is included as APPENDIX A to this Annual Report or currently ON FILE with the Division.

Certified Reports:	Reports Required?		INCLUDED or ON FILE w/DOGM?			Comments
	YES	NO	YES	NO	ON FILE	
1. Excess Spoil Piles		X				
2. Refuse Piles	X				X	Certified Reports previously submitted
3. Impoundments	X				X	Certified Reports previously submitted
4.						
5.						

REPORTING OF OTHER TECHNICAL DATA

List other technical data and information as required under the approved plan which must be periodically submitted to the Division. Specify whether the information is included as APPENDIX B to this Annual Report or currently ON FILE with the Division.

Technical Data:	Reports Required?		INCLUDED or ON FILE w/DOGM?			Comments
	YES	NO	YES	NO	ON FILE	
1. Climatological Data	x		x			Included on disk in Appendix B
2. Subsidence Monitoring Data	x		x			Included in Appendix B
3. Vegetation Monitoring Data	x		x			Included in Appendix B
4. Soils Monitoring Data		x				
5. Water Monitoring Data						
First Quarter Report	x				x	Data Previously Submitted
Second Quarter Report	x				x	Data Previously Submitted
Third Quarter Report	x				x	Data Previously Submitted
Fourth Quarter Report	x				x	Data Previously Submitted
6. Geological/Geophysical Data		x				
7. Engineering Data		x				
8. Other Data						
Raptor Survey Data	x		x			Included in Appendix B
Abandoned U/G Equipment						Waiting on clarification from the Division and USFS on equipment under ground.
Refuse Analyses	x		x			Appendix E <i>MRB</i>

APPENDIX A

Certified Reports

Excess Spoil Piles
Refuse Piles
Impoundments

as required under R645-301-514

CONTENTS

None - Certified Reports previously submitted.

APPENDIX B

Reporting of Technical Data

including monitoring data, reports, maps, and other information
as required under the approved plan
or as required by the Division

in accordance with the requirements of R645-301-130 and R645-301-140.

CONTENTS

Climatological Data on Disk
Subsidence Report
Vegetation Monitoring Report
Raptor Survey Data

1998 SUBSIDENCE REPORT

CANYON FUEL COMPANY, LLC

SUFCO MINE

by

JOHN M. BLACK

CHIEF SURVEYOR

INTRODUCTION

Canyon Fuel Company LLC, SUFCO Mine's 1998 subsidence report is an update of annual subsidence data which has been accumulated since 1976 as the former Southern Utah Fuel Company. Prior to 1985, the data was derived from conventional survey methods. Since then, photogrammetric surveys have been employed to monitor the ground movement.

During 1985, the entire SUFCO Mine property was flown to establish a set of baseline photography and a grid of surface elevations. Where possible, an elevation was photogrammetrically determined on an approximate 200 foot grid. These original x, y and z locations serve as a comparative base for determining ground movement in the succeeding years. In 1991, the newly obtained lease U-63214 was flown for a baseline as before with the other leases.

Once each year, another set of aerial photography is obtained. A new elevation is then found at the same x and y coordinates as all the originals within all areas considered to be active. The new, or current, elevations are compared to the originals and the difference between the two is used to generate a contour map. The result is the subsidence contour map included with each annual subsidence report.

The mine subsidence map accompanying this report shows surface control monuments, overburden contours, subsidence contours, surface tension cracks, a current outline of the mine, a one year mining projection and other miscellaneous items as explained in the legend.

SUBSIDENCE HISTORY

SUFCO Mine began operations which cause surface subsidence in June, 1976. Continuous miners were used to extract coal from pillars which were developed as part of a retreating panel. The panels were approximately 650 feet wide and varied in length up to 2,500 feet. The average mining height approached 11 feet and the extraction ratio averaged about 80%.

The resulting subsidence from these continuous miner panels averaged 4 feet in the plateau areas where overburden was 900 feet thick. In areas where panel boundaries were outside the escarpment and beyond the Castlegate Sandstone, subsidence increased with decreasing overburden thickness. The maximum subsidence measured to date, 8.5 feet, occurred in one of these areas. The overburden was only 600 feet thick.

Retreat mining continued in this manner until October, 1985, when a retreating longwall system was added. Longwall panels have ranged from 550 feet to 930 feet wide and up to 14,150 feet in length. Mining heights have varied from 8.5 feet to 12 feet.

Subsidence above the longwall panels has averaged 4 feet. The overburden thickness has been as much as 1,800 feet. The Maximum measured subsidence caused by longwall mining is seven feet. This occurred in an area outside the escarpment very similar to the one mentioned above for the continuous miner panel.

DORMANT AND ACTIVE AREAS

Dormant areas are those areas that have shown no movement for several consecutive years. Yearly digitizing of these areas will not be done, but photographic coverage will be maintained in the event that a need should arise for reevaluation.

Active areas are currently being mined or that have evidence of movement within a reasonable time period. Active areas are digitized and evaluated for subsidence yearly, until they meet the parameters of a dormant area.

1998 SUBSIDENCE

The 1997 subsidence map (Map 1) was updated using data from current photogrammetric monitoring. Each subsidence area is labeled as an independent block. A brief description of each follows:

AREA 1

This was SUFCO Mine's first subsidence area. Undermining began in June, 1976, and continued into 1979. The area is composed of five continuous miner panels which averaged 650 feet in width. Mining height averaged 11 feet with about an 80% extraction ratio.

Maximum subsidence ranged from 4.5 feet to 8.5 feet. It was first detected in 1976 and continued until 1985. No surface movement was detected in this entire area from 1986 to 1989. Area 1 was not digitized for the 1990 subsidence report and is considered dormant.

AREA 2

This is another continuous miner area. The panels here were irregular shaped and the extraction ratio was modest. Undermining ceased in 1984.

Maximum subsidence has been measured at 2 feet. The area has been stable since 1985 and has not been monitored since 1989. This area is dormant.

AREA 3

This area is another continuous miner section, but the extracted area is a portion of mains with protective barriers instead of a panel. Coal recovery was moderate with mined areas which were subcritical. Undermining ceased in 1983.

Maximum subsidence was measured at 2 feet. Because of the limited extraction and subcritical areas, the subsidence occurred slowly with small changes noticeable until 1987. The area appeared stable in 1988 and 1989. It has not been monitored since 1989 and is considered dormant.

AREA 4

This subsidence area is comprised of three continuous miner panels. The mining height averaged 11 feet with a good extraction ratio. Undermining ceased in 1985.

Maximum subsidence was 5 feet with no detectable change in 1989. This area was monitored again in 1993, 1994 and 1995 with no detectable changes. This area was monitored for ten years after undermining ceased. The last detectable subsidence was in 1988. Therefore, this area will be considered dormant.

AREA 5

The four continuous miner panels which make up this area were mined from September, 1978, to November, 1981. Mining height averaged 11 feet with an 80% extraction ratio.

Maximum subsidence was 5 feet with no detectable changes from 1985 through 1991. This area has not been monitored since 1991, and will also remain dormant.

AREA 6

Area 6 is SUFCO Mine's first longwall induced subsidence area. It is comprised of nine longwall panels varying from 540 feet to 700 feet in width and 1,700 feet to 3,900 feet in length. Also, there is a section of recovered mains between two of the longwall blocks. Undermining began in Area 6 during October, 1985, and continued through the mains recovery in March, 1990.

Maximum subsidence measured in areas bounded by the plateau is five feet. There is a location on the map which shows seven feet; but this area is outside the escarpment where the overburden is only 600 feet thick. The subsided escarpment is intentional and is part of a study agreed upon by SUFCO Mine, the Division of Oil, Gas and Mining, the Bureau of Land Management and the U. S. Forest Service. This particular section of escarpment was removed from the "no subsidence zone" to study the effects of longwall mining on the escarpment.

Area 6 has shown no significant changes since 1992. It has been determined that this area is dormant.

AREA 7

Area 7 was originally planned for no subsidence. Pillars were made to support the overburden but began to fail in the north end in 1984 when the underground workings were flooded. The failures progressed towards the south and by 1986, subsidence was detected over the area.

The map shows up to seven feet of subsidence. There was no additional subsidence movement detected from 1988 to 1994. Therefore, this area will also be considered dormant.

AREA 8

Undermining this area began in June, 1983, and was sporadic until 1992. Continuous miners were used with extraction ratios over 80% and average mining heights of 10 feet. This area stayed active longer than most due to its proximity to an adjacent active longwall block.

Maximum subsidence is five feet. No noticeable vertical movement has been detected since 1993. This area is dormant.

AREA 9

This area is a longwall mining area which is composed of four panels. The first began in June, 1989 and the block was finished in January 1992. The mining height averaged about 11 feet and the maximum subsidence shown to date is five feet. There has been no indication of movement since 1996.

AREA 10

Area ten is a longwall mining block which began in January 1992 and is presently being mined. The entire surface area above this block was digitized for base-line elevations during 1991. Maximum subsidence shown to date is six feet. This area will be active for several more years.

The experimental mining practice area discussed under "Area 6" was extended, with regulatory approval, to the east side of the canyon under the Southwest corner of "Area 10". An extensive pre-mining survey of this location was conducted late in 1992. A detailed survey of the post-mining subsidence effects was provided in the 1993 report.

DRAW ANGLE SURVEYS

Several draw angle surveys have been performed during the past years. Completed surveys have been over continuous miner areas and have been oriented both parallel and perpendicular to the long axis of the panel. The average of all measurements is 15° . Individual measurements ranged from 10° to 21° .

New longwall draw angle data was obtained in 1995. Draw angle points were installed in May 1986, on the southern end of the first panel in "Area 6". As shown on the subsidence map, survey lines were placed parallel and perpendicular to the axis of the panel. Undermining of this panel was completed in June 1986. Measurements were taken in 1995 and indicate an angle 15.25° for the perpendicular line. An angle for the parallel line was not obtained because the mains underlying the survey line were partially extracted. These findings coincide with the average of 15° as stated above.

SUBSIDENCE TENSION CRACKS

Tension cracks have occurred above most of the subsidence areas. Most have been located by survey and are shown on the map. Their lengths vary from a few feet to five hundred feet. Most are oriented either parallel to the natural jointing pattern or to the boundaries of the underground excavation. Vertical displacement along the cracks is uncommon and horizontal displacement varies from hairline to several inches in width.

The U. S. Forest Service completed a tension crack study in 1978. They monitored twenty-two different cracks (located in Area 1) with widths varying from $1/8$ inch to six inches. Results show that most cracks self-heal, or close, from 13% to 100% of their original width.

DETAILED LONGWALL SUBSIDENCE PROFILE

In 1998 a project was initiated to monitor longwall subsidence in relation to the advancing face. Preparation consisted of first installing two monitoring points outside the subsidence area. Then two base lines were established one 3000 feet long running parallel down the center and the second 1300 feet long perpendicular across the 967 feet wide panel. Markers were installed along these lines on 100 feet spacing using approximately 2.5 feet long rebar with an aluminum cap or a hardened nail drilled into the exposed rock. Initial horizontal and vertical readings were obtained by shooting each marker with a Topcon GTS-3 distance meter from the monitoring points.

Monitoring was done weekly to gather new readings on markers behind and up to 500 feet ahead of the advancing face. Map 2 of this report shows the subsidence profile as it developed with face advancement and Appendix A data sheets show the horizontal and vertical movement of the weekly readings throughout this project. The data reveals that vertical movement starts approximately 150 feet ahead of the face with 15 hundredth of a foot of subsidence at the face. Then drops off quickly to 4 feet at 600 feet behind the face and gradually levels off at 4 to 5 feet. Horizontal readings indicate the ground initially moves about 30 hundredths of a foot away from the face, then back toward the face 80 hundredths of a foot.

CONCLUSION

Areas 1, 2, 3, 4, 5, 6, 7, 8 (6 and 8 were added this year) are all considered to be dormant. Photographic coverage will be maintained but yearly digitizing will not be done unless necessary. Yearly monitoring of Areas 9 and 10 will continue until subsidence has been determined to have ceased on an area by area basis.

A detailed subsidence survey was conducted this year to evaluate the relationship of ground subsidence in relation to the advancing longwall face. The included map and data sheets show rapid subsidence that follows the advancing face.

JMB:kb

SUFSRV\1\SUFFPUB\GOVT1998\BLMSUBSID98.RPT

APPENDIX A
DATA SHEETS

12L4E LONGWALL PANEL (20) SUBSIDENCE MONITORING

STATION	INITIAL '5-18-98			5-28-98			6-04-98			6-15-98			6-22-98			6-29-98		
	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.
2	130849.93	119399.97	8379.16	0.15	-0.01	-0.35	0.32	-0.05	-2.14	-0.22	-0.07	-3.83	-0.42	0.00	-4.11	-0.37	0.09	-4.20
3	130750.06	119399.92	8376.23	0.08	0.00	-0.14	0.37	0.02	-1.10	-0.02	0.02	-3.84	-0.29	0.08	-4.31	-0.30	0.12	-4.45
4	130629.93	119399.99	8373.41	0.05	0.01	-0.06	0.23	0.00	-0.43	0.22	0.04	-3.50	-0.17	0.07	-4.46	-0.20	0.10	-4.69
5	130549.98	119399.98	8372.29	0.05	0.03	-0.02	0.14	0.01	-0.24	0.47	-0.05	-1.76	-0.01	0.07	-3.53	-0.07	0.12	-3.86
6	130450.01	119399.91	8372.57	0.02	0.01	-0.01	0.11	0.01	-0.15	0.47	0.00	-1.16	0.01	0.16	-3.81	-0.11	0.20	-4.23
7	130350.07	119399.97	8371.40	0.01	0.01	0.03	0.08	0.02	-0.10	0.28	0.02	-0.60	0.10	0.03	-3.35	-0.05	0.03	-3.94
8	130250.04	119400.00	8370.22	0.02	-0.01	0.01	0.05	0.03	-0.08	0.16	0.07	-0.34	0.15	0.14	-2.94	-0.07	0.22	-4.09
9	130149.96	119399.93	8371.97				0.03	0.02	-0.02	0.08	0.07	-0.14	0.24	0.06	-1.72	-0.04	0.01	-3.90
10	130050.07	119400.00	8371.80				0.05	-0.01	-0.02	0.04	0.06	-0.08	0.22	0.01	-0.84	0.14	-0.06	-3.94
11	129950.10	119399.92	8373.62				0.03	0.01	0.00	0.03	0.09	-0.05	0.11	0.10	-0.35	0.27	0.03	-3.74
12	129850.06	119400.00	8374.47				0.02	0.01	0.03	0.00	0.09	-0.01	0.07	0.12	-0.13	0.35	0.06	-2.77
13	129750.07	119400.05	8373.30							0.01	0.09	0.02	0.05	0.13	-0.03	0.42	-0.02	-1.41
14	129650.17	119400.06	8372.82							0.02	0.06	0.01	0.02	0.10	0.01	0.03	-0.04	-0.53
15	129550.16	119400.06	8372.29							-0.01	0.06	-0.02	0.04	0.10	0.00	0.27	-0.01	-0.33
1	129450.12	119399.97	8372.22										-0.06	0.09	-0.03	-0.05	0.10	-0.17
16	129349.98	119400.03	8369.83										-0.04	0.05	-0.02	-0.02	0.07	-0.10
17	129250.10	119400.06	8369.82										0.00	0.03	-0.02	0.00	0.09	-0.04
18	129150.14	119400.08	8367.56													-0.01	0.09	0.00
19	129050.16	119400.06	8361.78													0.00	0.07	-0.01
20	128950.18	119400.12	8362.66													-0.01	0.03	0.01
21	128850.03	119400.10	8364.22															
22	128740.16	119400.08	8363.57															
23	128650.08	119400.07	8364.55															
24	128550.17	119400.15	8366.83															
25	128450.25	119400.12	8367.37															
26	128350.13	119400.12	8368.74															
27	128250.06	119400.08	8370.65															
28	128150.09	119400.14	8371.37															
29	128050.17	119400.24	8372.09															
30	127950.16	119400.12	8372.43															
31	127850.19	119400.27	8373.61															
32	129449.99	118900.11	8384.32													0.01	0.12	-0.19
33	129450.04	119000.02	8383.57													-0.01	0.15	-0.19
34	129450.01	119099.97	8380.81													-0.06	0.13	-0.19
35	129449.98	119200.04	8377.67													-0.03	0.13	-0.21
36	129450.06	119300.04	8374.73													0.02	0.09	-0.19
37	129450.12	119500.04	8369.22													0.03	0.06	-0.19
38	129450.13	119593.17	8366.61													-0.02	0.00	-0.15
39	129450.08	119700.11	8363.63													0.04	-0.02	-0.12
40	129450.11	119813.48	8355.19													0.18	-0.13	-0.09
41	129450.12	119899.91	8356.34													0.13	-0.11	-0.03
42	129450.10	119999.92	8362.86													-0.01	-0.01	-0.08
43	129450.16	120100.01	8365.31													0.00	-0.03	-0.02
44	129450.07	120199.81	8366.00													0.01	-0.01	-0.14

FACE AT NORTH = 130668

FACE AT NORTH = 130431

FACE AT NORTH = 130113

FACE AT NORTH = 129808

FACE AT NORTH = 129421

12L4E LONGWALL PANEL (20) SUBSIDENCE MONITORING

STATION	INITIAL '5-18-98			7-07-98			7-16-98			7-22-98			7-29-98			8-04-98		
	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.
2	130849.93	119399.97	8379.16				-0.60	0.03	-4.25	-0.50	0.07	-4.19	-0.55	0.07	-4.21	-0.60	0.02	-4.29
3	130750.06	119399.92	8376.23				-0.47	0.11	-4.56	-0.38	0.14	-4.49	-0.44	0.15	-4.52	-0.49	0.05	-4.56
4	130629.93	119399.99	8373.41				-0.45	0.07	-4.77	-0.31	0.11	-4.72	-0.40	0.12	-4.75	-0.48	0.02	-4.81
5	130549.98	119399.98	8372.29				-0.31	0.09	-4.00	-0.20	0.13	-3.95	-0.30	0.14	-3.98	-0.40	0.10	-4.01
6	130450.01	119399.91	8372.57				-0.42	0.18	-4.38	-0.28	0.20	-4.33	-0.40	0.19	-4.36	-0.48	0.17	-4.41
7	130350.07	119399.97	8371.40				-0.37	0.06	-4.14	-0.27	0.02	-4.11	-0.39	0.03	-4.18	-0.48	0.02	-4.19
8	130250.04	119400.00	8370.22				-0.43	0.29	-4.31	-0.34	0.25	-4.31	-0.43	0.29	-4.36	-0.55	0.24	-4.39
9	130149.96	119399.93	8371.97				-0.48	0.02	-4.25	-0.41	0.02	-4.22	-0.54	0.03	-4.27	-0.63	0.05	-4.29
10	130050.07	119400.00	8371.80				-0.40	0.01	-4.54	-0.33	-0.05	-4.52	-0.46	-0.01	-4.57	-0.59	-0.02	-4.61
11	129950.10	119399.92	8373.62				-0.39	0.18	-4.72	-0.31	0.09	-4.67	-0.44	0.15	-4.77	-0.56	0.17	-4.82
12	129850.06	119400.00	8374.47				-0.46	0.17	-4.55	-0.37	0.08	-4.58	-0.54	0.14	-4.66	-0.68	0.15	-4.75
13	129750.07	119400.05	8373.30	0.02	0.07	-3.50	-0.33	0.14	-4.22	-0.31	0.04	-4.29	-0.46	0.06	-4.37	-0.63	0.13	-4.41
14	129650.17	119400.06	8372.82	0.37	-0.07	-2.97	0.04	0.00	-4.29	-0.03	-0.12	-4.39	-0.18	-0.08	-4.50	-0.37	0.00	-4.53
15	129550.16	119400.06	8372.29	0.54	-0.07	-1.79	0.16	0.17	-4.28	0.05	0.12	-4.48	-0.02	0.08	-4.62	-0.22	0.17	-4.71
1	129450.12	119399.97	8372.22	-0.02	0.11	-0.68	-0.09	0.18	-4.06	-0.32	0.20	-4.47	-0.51	0.25	-4.60	-0.57	0.19	-4.78
16	129349.98	119400.03	8369.83	0.03	0.08	-0.30	-0.06	0.13	-3.81	-0.32	0.22	-4.46	-0.57	0.23	-4.68	-0.67	0.17	-4.87
17	129250.10	119400.06	8369.82	-0.07	0.07	-0.18	0.24	0.08	-3.05	-0.18	0.15	-4.37	-0.52	0.20	-4.75	-0.63	0.13	-5.03
18	129150.14	119400.08	8367.56	-0.08	0.10	-0.01	0.28	0.07	-1.44	0.03	0.12	-3.76	-0.39	0.15	-4.53	-0.60	0.12	-4.81
19	129050.16	119400.06	8361.78	-0.16	0.13	0.07	0.05	0.10	-0.46	0.15	0.12	-2.60	-0.31	0.18	-3.97	-0.50	0.14	-4.29
20	128950.18	119400.12	8362.66	0.11	0.11	-0.01	-0.01	0.08	-0.29	0.57	0.00	-1.46	0.28	0.00	-3.97	-0.05	-0.09	-4.53
21	128850.03	119400.10	8364.22	-0.11	0.06	0.05	-0.06	0.06	-0.19	0.49	0.00	-0.82	0.38	0.01	-3.51	0.04	-0.06	-4.54
22	128740.16	119400.08	8363.57	-0.12	0.13	-0.01	-0.11	0.12	-0.10	0.01	0.10	-0.25	0.47	0.05	-2.92	0.03	0.00	-4.88
23	128650.08	119400.07	8364.55				-0.10	0.12	-0.10	0.10	0.00	-0.06	0.59	-0.05	-1.37	-0.02	0.11	-4.36
24	128550.17	119400.15	8366.83				-0.08	0.11	0.02	0.13	-0.07	-0.03	0.31	0.04	-0.62	0.09	0.15	-3.85
25	128450.25	119400.12	8367.37				-0.10	0.19	-0.06	-0.08	0.17	-0.03	0.06	0.12	-0.31	0.18	0.17	-2.41
26	128350.13	119400.12	8368.74							-0.05	0.15	0.00	0.00	0.12	-0.13	0.20	0.09	-1.17
27	128250.06	119400.08	8370.65							-0.12	0.21	0.01	0.08	0.19	-0.09	0.01	0.16	-0.41
28	128150.09	119400.14	8371.37							-0.10	0.17	0.06	-0.04	0.13	0.03	-0.05	0.19	-0.05
29	128050.17	119400.24	8372.09										0.16	-0.17	-0.07	0.06	0.03	-0.05
30	127950.16	119400.12	8372.43										0.15	-0.08	0.01	0.05	0.16	0.03
31	127850.19	119400.27	8373.61										0.19	-0.17	0.02	0.09	0.07	0.08
32	129449.99	118900.11	8384.32	-0.07	0.23	-0.46	-0.24	0.42	-1.10	-0.32	0.43	-1.25	-0.49	0.49	-1.42	-0.58	0.45	-1.72
33	129450.04	119000.02	8383.57	-0.04	0.28	-0.54	-0.16	0.46	-1.27	-0.25	0.57	-1.50	-0.47	0.61	-1.66	-0.67	0.61	-1.90
34	129450.01	119099.97	8380.81	-0.05	0.24	-0.57	-0.18	0.54	-1.77	-0.40	0.64	-1.99	-0.55	0.70	-2.22	-0.66	0.66	-2.48
35	129449.98	119200.04	8377.67	0.01	0.21	-0.70	-0.08	0.55	-2.65	-0.29	0.62	-2.97	-0.47	0.64	-3.19	-0.61	0.63	-3.43
36	129450.06	119300.04	8374.73	0.06	0.17	-0.73	0.01	0.30	-3.67	-0.25	0.37	-4.07	-0.44	0.37	-4.21	-0.54	0.35	-4.40
37	129450.12	119500.04	8369.22	0.11	-0.01	-0.77	-0.07	0.02	-3.94	-0.24	0.06	-4.32	-0.37	0.08	-4.45	-0.52	0.03	-4.56
38	129450.13	119593.17	8366.61	0.06	-0.12	-0.57	0.01	-0.46	-2.86	-0.17	-0.48	-3.16	-0.25	-0.52	-3.33	-0.38	-0.59	-3.41
39	129450.08	119700.11	8363.63	0.03	-0.15	-0.35	-0.02	-0.38	-0.99	-0.09	-0.42	-1.13	-0.16	-0.46	-1.15	-0.21	-0.54	-1.26
40	129450.11	119813.48	8355.19	-0.19	0.16	-0.07	0.11	-0.12	-0.34	0.11	-0.34	-0.33	0.06	-0.31	-0.38	-0.02	-0.23	-0.37
41	129450.12	119899.91	8356.34	0.13	-0.17	-0.08	0.06	-0.04	-0.09	0.09	-0.21	-0.02	0.05	-0.12	-0.08	-0.01	-0.07	-0.07
42	129450.10	119999.92	8362.86	-0.01	-0.03	-0.09	-0.09	-0.03	-0.13	-0.08	-0.06	-0.14	-0.07	-0.05	-0.05	-0.08	-0.09	-0.06
43	129450.16	120100.01	8365.31	-0.01	-0.05	-0.04	-0.06	-0.05	-0.08	-0.07	-0.05	-0.07	-0.07	-0.07	-0.04	-0.06	-0.10	-0.05
44	129450.07	120199.81	8366.00	-0.04	-0.05	-0.02	-0.06	-0.04	-0.05	-0.04	-0.05	-0.04	-0.04	-0.04	0.00	-0.05	-0.08	-0.02

FACE AT NORTH = 129208

FACE AT NORTH = 128842

FACE AT NORTH = 128598

FACE AT NORTH = 128350

FACE AT NORTH = 128087

12L4E LONGWALL PANEL (20) SUBSIDENCE MONITORING

STATION	INITIAL '5-18-98			8-19-98			8-27-98			9-03-98		
	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.	NORTH	EAST	ELEV.
2	130849.93	119399.97	8379.16	-0.57	0.06	-4.27	-0.55	0.02	-4.31	-0.49	0.10	-4.26
3	130750.08	119399.92	8376.23	-0.45	0.11	-4.54	-0.43	0.12	-4.61	-0.39	0.15	-4.54
4	130829.93	119399.99	8373.41	-0.41	0.10	-4.82	-0.45	0.08	-4.80	-0.36	0.13	-4.86
5	130549.98	119399.98	8372.29	-0.34	0.11	-4.06	-0.34	0.12	-4.06	-0.30	0.11	-4.08
6	130450.01	119399.91	8372.57	-0.40	0.18	-4.44	-0.44	0.17	-4.44	-0.38	0.21	-4.52
7	130350.07	119399.97	8371.40	-0.40	0.01	-4.24	-0.45	0.04	-4.22	-0.36	0.00	-4.28
8	130250.04	119400.00	8370.22	-0.48	0.27	-4.40	-0.52	0.28	-4.42	-0.45	0.22	-4.48
9	130149.96	119399.93	8371.97	-0.56	0.03	-4.32	-0.61	0.02	-4.34	-0.52	-0.03	-4.38
10	130050.07	119400.00	8371.80	-0.49	-0.02	-4.64	-0.54	-0.02	-4.64	-0.50	-0.05	-4.70
11	129950.10	119399.92	8373.62	-0.48	0.11	-4.85	-0.53	0.13	-4.85	-0.52	0.10	-4.80
12	129850.06	119400.00	8374.47	-0.59	0.12	-4.77	-0.66	0.09	-4.79	-0.64	0.08	-4.82
13	129750.07	119400.05	8373.30	-0.53	0.06	-4.49	-0.59	0.07	-4.48	-0.57	0.04	-4.54
14	129650.17	119400.06	8372.82	-0.27	-0.14	-4.66	-0.34	-0.09	-4.62	-0.35	-0.10	-4.66
15	129550.16	119400.06	8372.29	-0.16	0.06	-4.79	-0.19	0.04	-4.81	-0.20	0.03	-4.85
1	129450.12	119399.97	8372.22	-0.57	0.21	-4.77	-0.67	0.18	-4.85	-0.70	0.14	-4.82
16	129349.98	119400.03	8369.83	-0.73	0.19	-4.95	-0.70	0.14	-4.97	-0.79	0.17	-4.96
17	129250.10	119400.06	8369.82	-0.62	0.15	-5.14	-0.68	0.14	-5.17	-0.79	0.12	-5.10
18	129150.14	119400.08	8367.56	-0.56	0.13	-4.99	-0.64	0.10	-4.98	-0.74	0.08	-4.98
19	129050.16	119400.06	8361.78	-0.49	0.15	-4.57	-0.59	0.17	-4.60	-0.72	0.08	-4.60
20	128950.18	119400.12	8362.66	-0.16	-0.10	-4.82	-0.19	-0.15	-4.88	-0.35	-0.11	-4.88
21	128850.03	119400.10	8364.22	-0.06	-0.02	-4.87	-0.12	-0.14	-4.93	-0.28	-0.14	-5.01
22	128740.18	119400.08	8363.57	-0.19	0.05	-5.26	-0.23	-0.07	-5.33	-0.41	0.04	-5.51
23	128650.08	119400.07	8364.55	-0.18	0.07	-4.99	-0.29	-0.03	-5.20	-0.40	0.01	-5.29
24	128550.17	119400.15	8366.83	-0.20	0.15	-5.10	-0.26	0.07	-5.28	-0.54	0.27	-5.34
25	128450.25	119400.12	8367.37	-0.14	0.25	-4.54	-0.31	0.18	-4.93	-0.51	0.31	-5.15
26	128350.13	119400.12	8368.74	0.23	0.06	-4.30	0.09	-0.09	-4.89	-0.25	0.09	-5.06
27	128250.06	119400.08	8370.65	0.27	0.09	-3.44	0.06	-0.01	-4.58	-0.24	0.18	-4.81
28	128150.09	119400.14	8371.37	0.40	0.05	-2.09	0.20	-0.08	-4.23	-0.23	0.14	-4.82
29	128050.17	119400.24	8372.09	0.44	-0.22	-0.84	0.18	-0.19	-3.70	-0.07	-0.14	-4.59
30	127950.16	119400.12	8372.43	0.29	-0.16	-0.28	0.22	0.01	-3.05	-0.06	-0.15	-4.47
31	127850.19	119400.27	8373.61	0.12	-0.22	-0.09	0.37	-0.14	-1.75	0.12	-0.29	-4.21
32	129449.99	118900.11	8384.32	-0.62	0.51	-1.61	-0.57	0.50	-1.78	-0.74	0.54	-1.71
33	129450.04	119000.02	8383.57	-0.59	0.65	-1.84	-0.59	0.62	-2.04	-0.71	0.63	-1.92
34	129450.01	119099.97	8380.81	-0.66	0.69	-2.50	-0.66	0.34	-2.58	-0.77	0.66	-2.50
35	129449.98	119200.04	8377.67	-0.61	0.67	-3.42	-0.65	0.59	-3.52	-0.75	0.62	-3.48
36	129450.08	119300.04	8374.73	-0.54	0.33	-4.39	-0.61	0.30	-4.52	-0.67	0.36	-4.45
37	129450.12	119500.04	8369.22	-0.49	0.05	-4.58	-0.52	0.01	-4.68	-0.55	-0.01	-4.64
38	129450.13	119593.17	8366.61	-0.28	-0.57	-3.42	-0.34	-0.61	-3.49	-0.36	-0.61	-3.45
39	129450.08	119700.11	8363.63	-0.16	-0.53	-1.21	-0.19	-0.56	-1.34	-0.24	-0.57	-1.29
40	129450.11	119813.48	8355.19	-0.01	-0.31	-0.39	-0.03	-0.32	-0.39	-0.03	-0.38	-0.47
41	129450.12	119899.91	8356.34	0.01	-0.16	-0.09	-0.02	-0.15	-0.11	-0.01	-0.14	-0.16
42	129450.10	119999.92	8362.86	-0.08	-0.07	-0.10	-0.13	-0.10	-0.08	-0.12	-0.12	-0.08
43	129450.16	120100.01	8365.31	-0.07	-0.08	-0.06	-0.09	-0.10	-0.06	-0.08	-0.11	-0.06
44	129450.07	120199.81	8366.00	-0.05	-0.06	-0.03	-0.05	-0.07	-0.02	-0.05	-0.09	-0.04

FACE AT NORTH = 127797

FACE AT NORTH = 127518

FACE AT NORTH = 127281

Vegetation Monitoring
of the
Waste Rock Disposal

Prepared for:

Southern Utah Fuels Company
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Attention: Mr. Michael L. Davis
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6 July 1998

INTRODUCTION

This report describes the 23rd June 1998 sampling and monitoring of Southern Utah Fuels Company (SUFCO) waste rock disposal (WRD) site and Demonstration Plot (DEM). The WRD site was sampled previously during 1992, 1994, 1995, and 1996. This year represents the fifth year of monitoring the WRD and the second year of sampling and monitoring the DEM plot.

The WRD site is composed of two parts; the smooth east side first lift, and a pitted second lift contiguous to the west. A third lift is now almost filled with waste rock and will be reclaimed subsequently and included in subsequent reports. The DEM plot is located immediately east of the SUFCO main office building at the Convulsion Canyon mine. The currently reclaimed lifts of the WRD represent two different treatments and evidently two different seed mixtures. The lifts have been sampled separately and the results compared. The second, pitted lift was treated and reclaimed in 1994. Comparison data for the two treatment methodologies are included in Table 1 and Table 2 respectively. Results of the DEM measurements are included in Table 3. Comparison data for 1992, 1994, 1995, 1996, 1998 WRD and the 1992 reference site are included in Table 4.

Vegetation was measured at or near the height of the growing season, following a year of abundant rainfall.

Methods

Sampling techniques complied with Division of Oil Gas and Mining (DOG M) vegetation guidelines (February 1992), and were discussed with Paul Baker (Reclamation Specialist DOGM) in 1992. Sampling was conducted by Drs. Stanley L. Welsh and Ronald J. Kass of Endangered Plant Studies.

Percent cover was estimated by the ocular method for all plots. A 75 m tape was stretched across the longest axis of each treatment type on the WRD and on the DEM. Random numbers were generated and the corresponding numbers were used to locate the 1m² quadrats along the 75 m transect. After sampling a minimum of 15 quadrats, sample adequacy was computed; minimal sample size for the each WRD treatment was N=15. A t-value=1.645 and d-value=0.1 were used as coefficients to calculate sample adequacy.

Results

WRD-First Lift-Smooth

Total mean plant cover was 77.1% (s=4.85). Grasses accounted for 76.5% or 93.3% of the species composition. Shrubs contributed 0.5 of the cover and 0.7% of the species composition (Table 1).

WRD-Second Lift-Pitted

Total mean plant cover was 71.0% (S=7.2). Grasses accounted for 51.9% comprising 73.1% of the species composition. Forbs accounted for 8.3%, representing 11.7% of the species composition, and shrubs contributed 10.8%, or 15.2% of the species composition (Table 2).

DEM-Demonstration Plot

Total mean plant cover was 71.6% (S=12.2). Grasses accounted for 64.3% of the cover, and

represented 89.5% of the species composition. Forbs accounted for 3.7% of the cover and 5.1% of the species composition. Shrubs accounted for 5.1% of the cover and 3.7% of the species composition (Table 3).

Table 1. Percent cover and species composition of WRD first lift, smooth.

	% cover	% composition
Bare ground	14.5	
Litter	8.0	
<u>Grasses</u>		
Elymus cinereus	3.5	4.5
Elymus lanceolatus	2.8	3.6
Elymus smithii	60.2	78.2
Elymus spicatus	10.0	13.0
Grass totals	76.5	99.3
<u>Shrubs</u>		
Rosa woodsii	0.5	0.7
Shrub totals	0.5	0.7
Live Cover Total	77.0	100.0

Table 2. Percent cover and species composition for WRD second lift, pitted.

	% cover	% composition
Bare ground	20.3	
Litter	8.7	
<u>Grasses</u>		
Agropyron cristatum	2.5	3.5
Dactylis glomerata	21.0	29.7
Elymus cinereus	4.2	5.9
Elymus lanceolatus	0.5	0.7
Elymus smithii	10.7	15.1
Elymus spicatus	13.0	18.3
Grass totals	51.9	73.1
<u>Forbs</u>		
Achillea millefolium	3.5	4.9
Astragalus drummondii	t	
Linum perenne	2.8	3.9
Penstemon palmeri	2.0	2.8
Forb totals	8.3	11.6
<u>Shrubs</u>		
Amelanchier utahensis	t	
Artemisia tridentata	6.0	8.4
Chrysothamnus nauseosus	4.8	6.8
Rosa woodsii	t	
Shrub totals	10.8	15.2
Live Cover Totals	71.0	100

Table 3. Percent cover and species composition for DEM-Demonstration plot.

	% cover	% composition
Bare ground	15.4	
Litter	12.8	
<u>Grasses</u>		
Agropyron cristatum	12.2	17.0
Bromus inermis	0.9	1.3
Elymus cinereus	11.1	15.5
Elymus hispidus	24.3	33.9
Elymus lanceolatus	12.7	17.7
Elymus smithii	0.3	0.4
Stipa hymenoides	2.5	3.5
Stipa lettermanii	0.3	0.4
Grass totals	64.3	89.7
<u>Forbs</u>		
Achillea millefolium	0.6	0.8
Linum perenne	2.7	3.8
Tragopogon dubius	0.4	0.6
Forb totals	3.7	5.2
<u>Shrubs</u>		
Eriogonum corymbosum	3.7	5.2
Shrub totals	3.7	5.2
Live Cover Totals	71.6	100.1

Table 4. Percent cover and species richness for 1992, 1994, 1995, and 1992 reference site.

Years Variables	1992 1st li	1994 1st li	1995 2nd li	1995 1st li	1996 2nd li	1996 1st li	1998 2nd li	1998 1st li	Ref. site
Bare ground	35.4	28.6	31.8	16.7	26.7	21.0	20.3	14.5	8.8
Litter	8.3	12.2	8.3	12.3	20.4	32.9	8.7	8.0	24.0
Grasses	45.1	30.3	36.7	68.7	41.9	44.9	51.9	76.5	30.1
Forbs	11.2	27.0	20.9	1.1	8.1	0.8	8.3	0.0	0.2
Shrubs	0.0	2.0	2.3	1.0	2.9	0.4	10.8	0.5	36.8
Totals	56.3	59.4	59.7	71.0	52.9	46.1	71.0	77.1	67.2
Species richness	14	16	20	19	13	6	14	5	7

Table 5. Percent cover and species richness for DEM plot, 1996-1998.

Variables	1996	1998
Bare ground	15.0	15.4
Litter	36.0	12.8
Grasses	39.7	64.3
Forbs	4.5	3.7
Shrubs	4.3	3.7
Percent Live Cover	49.0	71.6
Species richness	14	12

Discussion

The 1998 investigation of plant cover and species richness follows an exceptionally wet and cool growing season. The vegetative cover reflects to a large extent the weather regime of the current year. The two different treatments given to lifts one and two respectively continue to respond well in the reclamation attempt. Total live cover for the first lift vegetation continues at a high level, starting at 56.3% in 1992, 59.4% in 1994, 71.0% in 1995, falling to 46.1% in the drought year of 1996, and rising to 77.1% during the current year. The trend over the five measurements is upward, averaging at or near that of the reference site's 67.2%.

Total live cover for the second lift was 59.7% when first measured in 1995, dropped to 52.9% during the drought year of 1996, and responded at 71.0% during the current wet year. It too averages near the reference site total live cover.

The east portion, i.e., Lift 1, was graded to a smooth surface prior to planting before 1992—that of Lift 2, was treated to a basin-lifting technique that resulted in a dimpled surface. Effects of the 1996 drought were especially apparent on the smooth surface of Lift 1, but recovery during the wet year of 1998 is readily apparent. Both treatments, which apparently received different seed mixtures, have responded well in spite of the drought interlude of 1996. Shrubs are doing better on the dimpled second lift than on the smooth first lift treatment, while grasses provide more of the live cover on the smooth treatment. Only the first lift treatment has resulted in less species richness than for the reference site.

A possible solution to increasing shrubs in the long term, as emphasized in the 1995 and 1996 reports, might involve harvesting of mature inflorescences of big sagebrush and perhaps rabbitbrush from below the reference site and broadcasting them on both lifts one and two. That should provide an abundant seed source on site. Substantial germination of sagebrush seeds might increase the potential for shrub intermix among the other grass and forb vegetation. Lack of forbs on the first lift quadrats is a result of sampling in large part, but represents the continued decline in forbs following their initial success. Such a decline is predictable.

The demonstration site, on a steep slope (58%) immediately east of the loadout area in Convulsion Canyon, was measured this year for the second time. Despite the steepness of the slope and the use of very raw substrate, the success of the revegetation attempt is readily apparent. Increased vegetative cover reflects in some part the wetter than normal growing season. There is still evidence of creep of the soil mantle at the upper edge of the slope, but general stability of the remainder continues to be encouraging. Establishment of the native buckwheat, Eriogonum corymbosum, is likewise encouraging. This plant is evident as a dominant on the adjoining, untreated, slope. It is a common component of vegetation along the coal measures in Utah.

- CONFIDENTIAL INFORMATION -

1998 Raptor Survey report has been removed from the Annual Report and is located in the Canyon Fuel Company, LLC – Sufco Mine Confidential MRP Binder located at:

Division of Oil, Gas & Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

INCORPORATED

AUG 08 2005

DIV OF OIL GAS & MINING

APPENDIX C

Legal, Financial, Compliance and Related Information

Annual Report of Officers
as submitted to the Utah Department of Commerce

and other changes in ownership and control information
as required under R645-301-110.

CONTENTS

None. This information was included in the June 1, 1998
submittal for permit notice of change in ownership and control.

APPENDIX D

Mine Maps

as required under R645-301-525.270.

CONTENTS

Mining Progress Map 1998

APPENDIX E

Other Information

in accordance with the requirements of R645-301 and R645-302.

CONTENTS

None



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Canyon Fuel Company
SUTCO Tech (307) 672-8945

SOUTHERN UTAH FUEL COMPANY
SALINA, UTAH

October 23, 1998

Page 1 of 2

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR
159100	WRDS 3QTR 98		7.4	5.51	38.9	24.4	16.4	23.4	5.18

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SALINA, UTAH

October 23, 1998

Page 2 of 2

Lab No.	Location	Depths	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t	Boron ppm	Selenium ppm	Alkalinity PE meq/l
159100	WRDS 3QTR 98		0.37	11.6	99.7	88.1						5.16	0.02	1.90

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Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Neut. Pot.= Neutralization Potential



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 MINE: DUGOUT CANYON

September 14, 1998

Page 1 of 3

Lab No.	Location	Depths feet	pH	EC mmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Sand %	Silt %	Clay %	Texture
155184	WASTE ROCK 1	0.0-0.0	7.2	4.36	24.2	17.8	41.9	0.98	0.18	49.0	25.0	26.0	SANDY CLAY LOAM

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Lab No.	Location	Depths feet	Total Organic Carbon %	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t
155184	WASTE ROCK 1	0.0-0.0	8.1	2.42	75.6	81.2	5.55					

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Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur,
 Neut. Pot.= Neutralization Potential



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MINE: DUGOUT CANYON

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Lab No.	Location	Depths feet	Nitrate- Nitrogen ppm	Boron ppm	Avail Na meq/100g	Exch Na meq/100g	Total Kjeldahl Nitrogen %	AB-DTPA Selenium ppm	1/3 bar	15 bar
155184	WASTE ROCK 1	0.0-0.0	0.36	0.53	0.32	0.30	0.09	0.06	12.3	5.6

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Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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 SALINA, UTAH

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR
155659	WRDS 2QTR98		7.2	5.13	45.9	16.2	9.56	28.4	7.92

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Lab No.	Location	Depths	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t	Boron ppm	Selenium ppm	Alkalinity PE meq/l
155659	WRDS 2QTR98		0.49	15.3	68.3	53.0						4.96	0.02	2.57

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 Pot.= Neutralization Potential



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 MINE: SKYLINE

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Sand %	Silt %	Clay %	Texture
155184	WASTE ROCK 1 TEMPORARY GOR PILE		7.2	4.36	24.2	17.8	41.9	0.98	0.18	49.0	25.0	26.0	SANDY CLAY LOAM

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Lab No.	Location	Depths	Total Organic Carbon %	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS ABP t/1000t
155184	WASTE ROCK 1		8.1	2.42	75.6	81.2	5.55					

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Lab No.	Location	Depths	Nitrate-Nitrogen ppm	Boron ppm	Avail Na meq/100g	Exch Na meq/100g	Total Kjeldahl Nitrogen %	AB-DTPA Selenium ppm	1/3 bar	15 bar
155184	WASTE ROCK 1		0.36	0.53	0.32	0.30	0.09	0.06	12.3	5.6

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Abbreviations for extractants: PE= Saturated Paste Extract, H2Osol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Lab No.	Location	Depths	pH	EC µmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR
151604	WRDS 1QTR98		7.4	8.79	46.2	20.0	9.68	60.9	15.8

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April 17, 1998

Lab No.	Location	Depths	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t	Sulfate Sulfur ‡	Pyritic Sulfur ‡	Organic Sulfur ‡	PyrS AB t/1000t	PyrS ABP t/1000t	Boron ppm	Selenium ppm	Alkalinity PE meq/l
151604	WRDS 1QTR98		0.37	11.6	78.1	66.6						3.69	<0.02	2.72

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Neut. Pot.= Neutralization Potential



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January 14, 1998

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Satur- ation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. t/1000t	T.S. ABP t/1000t
149984	WRDS 4QTR97		7.3	8.14	45.3	32.8	40.2	13.8	2.28	0.68	21.2	86.8	65.5

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Lab No.	Location	Depths	Boron ppm	Selenium ppm	Alkalinity PE meq/l
149984	WRDS 4QTR97		3.45	<0.02	3.01

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