RA ATTACHMENT 2-3

SOIL BORROW AREA

Mine # C/007/0039
File Incoming
Record # 0026
Doc. Date 4.06.06
Recd. Date 4.07.06

SOIL INVENTORY AND ASSESSMENT
SOIL BORROW AREA
DUGOUT CANYON MINE
CARBON COUNTY, UTAH

Prepared For:
CANYON FUEL COMPANY, LLC
PO BOX 1029
WELLINGTON, UTAH 84526

Prepared By:
Daniel M. Larsen
Professional Soil Scientist

TABLE OF CONTENTS

1. Introduction and Setting
2. Procedures
3. Soil Resources
    - Soil Inventory Results
    - Soil Testing Results
4. Soil Suitability Assessment

LIST OF APPENDICES

Appendix A Site Map and Soil Pit Locations
Appendix B Soil Analysis Report
Appendix C Soil Suitability Ratings
Appendix D Soil Profile Descriptions and Carbon Area Soil Survey Mapping Information
Appendix E Photographs of Site and Soil Profiles

1. Introduction and Setting

The soil inventory and assessment was conducted to evaluate a site proposed as a soil borrow area for the reclamation of Dugout Canyon Mine's refuse pile. The site is located in Section 17, Township 13 South, Range 12 East (Appendix A). The site is approximately 20 acres in size and photographs of the site have been included in Appendix E.

The site is in an alluvial fan valley fill position with relatively gentle slopes at an elevation of approximately 5800 feet. Slopes are 3 to 5 percent with a fairly smooth surface that has been dissected by gullies.

Typical vegetation includes Indian Rice Grass, Shadscale, Sagebrush and various other species. Annual precipitation is estimated at 8 inches and the average annual air temperature is 48 degrees Fahrenheit.

2. Procedures

Field work was conducted the first week of October, 2005. Spot checks were made by the use of a spade, hand soil auger, and observation of soils in erosional cuts such as gullies. Nine locations were selected for backhoe pits to obtain soil samples and allow soil descriptions. Each site was marked with a flagged stake and identified by SB-1 through SB-9. The soil pits were dug by Scamp Excavation on October 5, 2005. The pits were described and sampled by Dan Larsen, Soil Scientist on October 5th and 6th. Samples were submitted to Intermountain Laboratories, Inc., of Sheridan, Wyoming for testing of selected parameters required by the Utah Division of Oil, Gas and Mining (UDOGM). The soils were rated for suitability based on UDOGM Guidelines.

3. Soil Resources

The site has been mapped as "Ravola loam, 1 to 6 percent slopes, eroded" (Soil Map Unit 91) in the Soil Survey of the Carbon Area, Utah by the USDA, Soil Conservation Service, issued 1988. Ravola soils are very deep, well drained, and moderately permeable. They are classified as fine-silty, mixed, active, calcareous, mesic Typic Torrifluvents.

A copy of the order three level of mapping, a description of soil map Unit 91 and an official series description of the Ravola soil are included in Appendix D for reference. This soil map unit in not considered as prime farmland and the soils are listed as being fair for use as topsoil.

Soil Inventory Results

The soils on the site are fairly uniform in characteristics and would typically classify as the Ravola soil series. Of the nine soil profiles described there were only minor differences. The site is at the upper elevation limits of the Ravola series and there is a trend toward the Hernandez soil series which has a calcic horizon (more carbonates) and the particle size class is fine-loamy instead of fine silty.

For soil mapping purposes the site is basically one unit except for gullies which would reduce or eliminate the amount of soil available. The soils have formed in very deep (greater than 60 inches) alluvium derived from sandstone and shale. The most common texture is loam; however the amount of very fine sand dominates the total sand fraction and gives these soils characteristics similar to silt loam and yields a particle size class of fine-silty. A contrasting layer of soil about 4 to 8 inches, having more sand and fine gravel is present over much of the area at a depth of 38 to 45 inches.

The soils typically have brown to light grayish brown colors. The profiles show little change in color although the surface is slightly darker and the subsoils are lighter due to increases in carbonates and lower organic matter. They are generally low in soil organic matter and lack the dark colors typical of topsoil developed in moister environments.

Soil structure is typically fine granular and platy at the surface and becomes more blocky or massive with depth. The soils are moderately permeable and have a moderately high to high soil erodibility. The erosion hazard of the site is favored by the low degree of slope. Detailed soil descriptions are presented in Appendix D.

Soil Testing Results

The soil analytical results from Intermountain Laboratories are presented in Appendix B. A copy of the analytical results were used to record the suitability ratings for the soil samples. The suitability ratings are contained in Appendix C.

A summary of the analytical results is given below for suitability parameters.

PH - Ranged from 7.6 to 8.4, rated good to fair

Saturation % - Ranged from 23.8 to 46.4%, all rated good except for sample SB-8, 39 - 47" which rated poor due to a sandy layer

Electrical Conductivity - Ranged from 0.22 to 12.2 dS/m
Above 30 inches all samples were less than 4.0 dS/m
Nine subsoil samples were between 4.0 and 8.0 giving a rating of fair
Two samples had Electrical Conductivity greater than 8.0:
SB-6 - 48 - 68" = 8.38 dS/m
SB-9 - 36 - 72" = 12.3 dS/m

Sodium Adsorption Ratio (SAR) - Ranged from 0.18 to 11.9, the majority of the samples were below 4.0. Ten samples were rated fair with readings of between 4.0 and 10. Sample SB-9, 36-72" (11.9) had a poor rating

Texture - Laboratory analysis resulted in a particle size distribution yielding textures of loam and sandy loam except for one sample which barely fell into a silty clay loam class. Sandy loam

and loam rate as good for topsoil. The very fine sand is commonly 70 to 90 percent of the total sand content. Very fine sand plus silt is commonly about 65 to 75 percent of the overall soil matrix (mostly fine-silty). Clay content ranges from 12 to 28 percent. Rock fragments are generally less than 5 percent.

Available Water Capacity (AWC) - Ranged from 7.6 to 19.8 percent
Seven samples were between 7.6 and 10 percent with a fair rating
All other samples rated as good (>10%)

Acid/Base Potential - Ranged from 127 to 197 tons/1000 tons, all ratings are acceptable

Boron - Ranged from 0.12 to 1.14 ppm, all rated acceptable

Selenium - Ranged from less than 0.02 to 0.28 ppm
Samples SB-1, 54 to 78 inches and SB-5, 56 to 68 inches were rated unacceptable
Samples SB-1, 32 to 54 inches and SB-8, 47 to 72 inches were near unacceptable

Total Organic Carbon (TOC) - Ranged from less than 0.1 percent to 1.4 percent. All rated good at less then 10%, but show overall low organic matter content for topsoil

%$CaCO^3$ - Based on the acid base potential it is estimated that carbonates are about 10 to 20 percent, rating good to fair.

4. Soil Suitability Assessment

The area is fairly uniform for soil salvage, except where gullies are present. Rating the soils for suitability for use in reclamation was based on Table 4, "Soil and Spoil Suitability/Unsuitability Evaluation " in Guidelines for Management of Topsoil and Overburden, R645-301-200 Soils, State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining, draft June 2003.

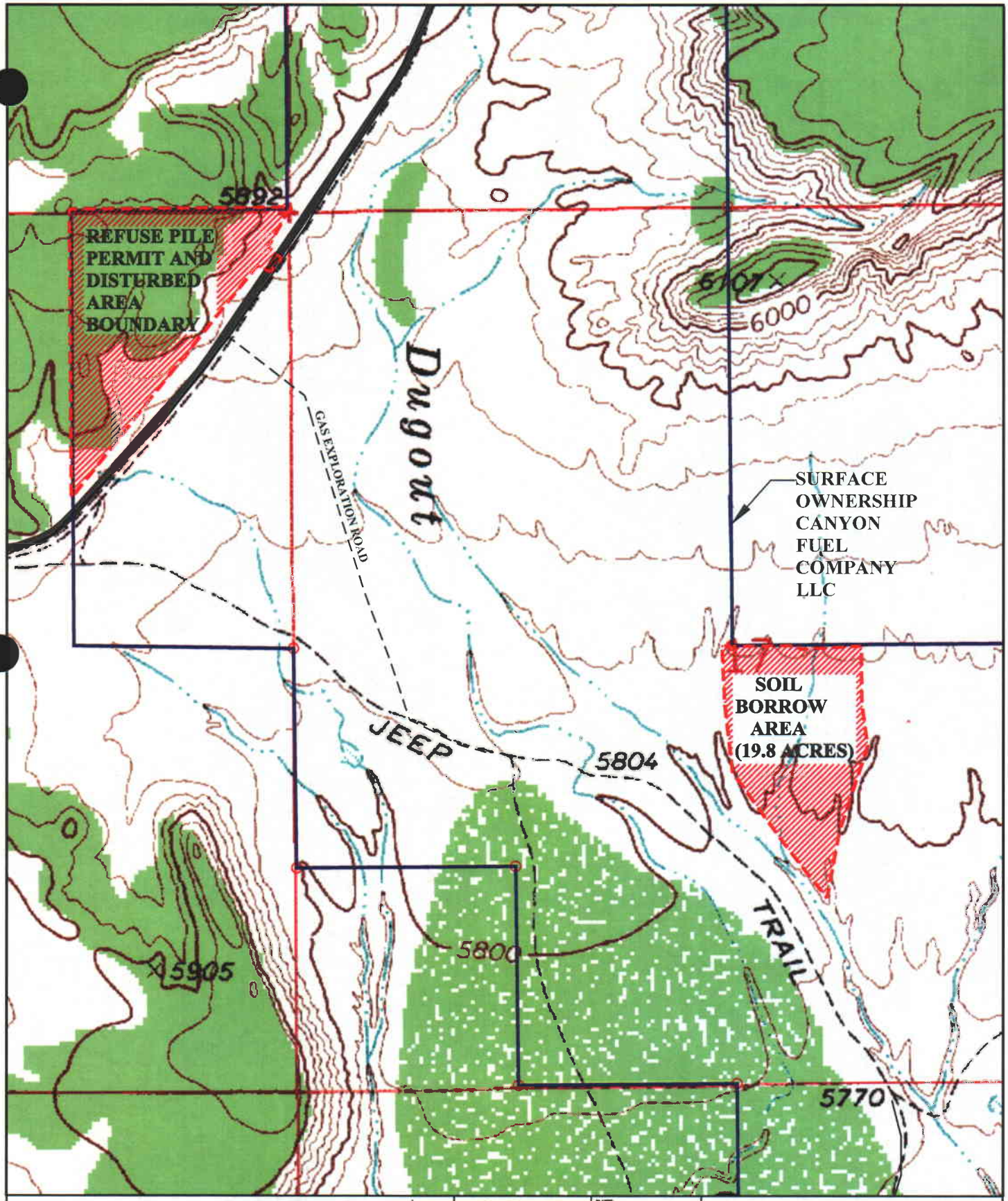
The most suitable soils are in the upper 18 to 36 inches of the borrow area soils although the overall rating would be fair to poor based on a moderately high to high soil erodability factor. Estimates give a K-factor (soil erodiblility) of about 0.37 to 0.43. A K-factor of 0.37 is considered "fair" and greater than 0.37 is considered "poor".

In the upper 36 inches of the samples, six of the soil profiles had pH ranging from 8.2 to 8.4 (fair rating). Several samples rated fair due to moderately high EC, SAR and carbonates and low available water capacity.

Below 36 inches some soil samples rated poor in factors including low saturated percentage, high EC and high SAR. Two samples (SB-1 and SB-5) had unacceptable levels of selenium below a depth of about 54 inches.

APPENDIX A

Site Map
Soil Pit Locations



SOIL BORROW AREA IS LOCATED IN SECTION 17, T14S R12E

REVISIONS OR UP-DATES			DATE: 1-19-06	
NO.	DATE	BY	DESIGNED BY:	
			DRAWN BY:	SC
			CHECKED BY:	
			SCALE:	1"=800'

FILENAME: Y:\SAW\CAD\SURFACE\SOIL BORROW AREA WASTEROCKAREA

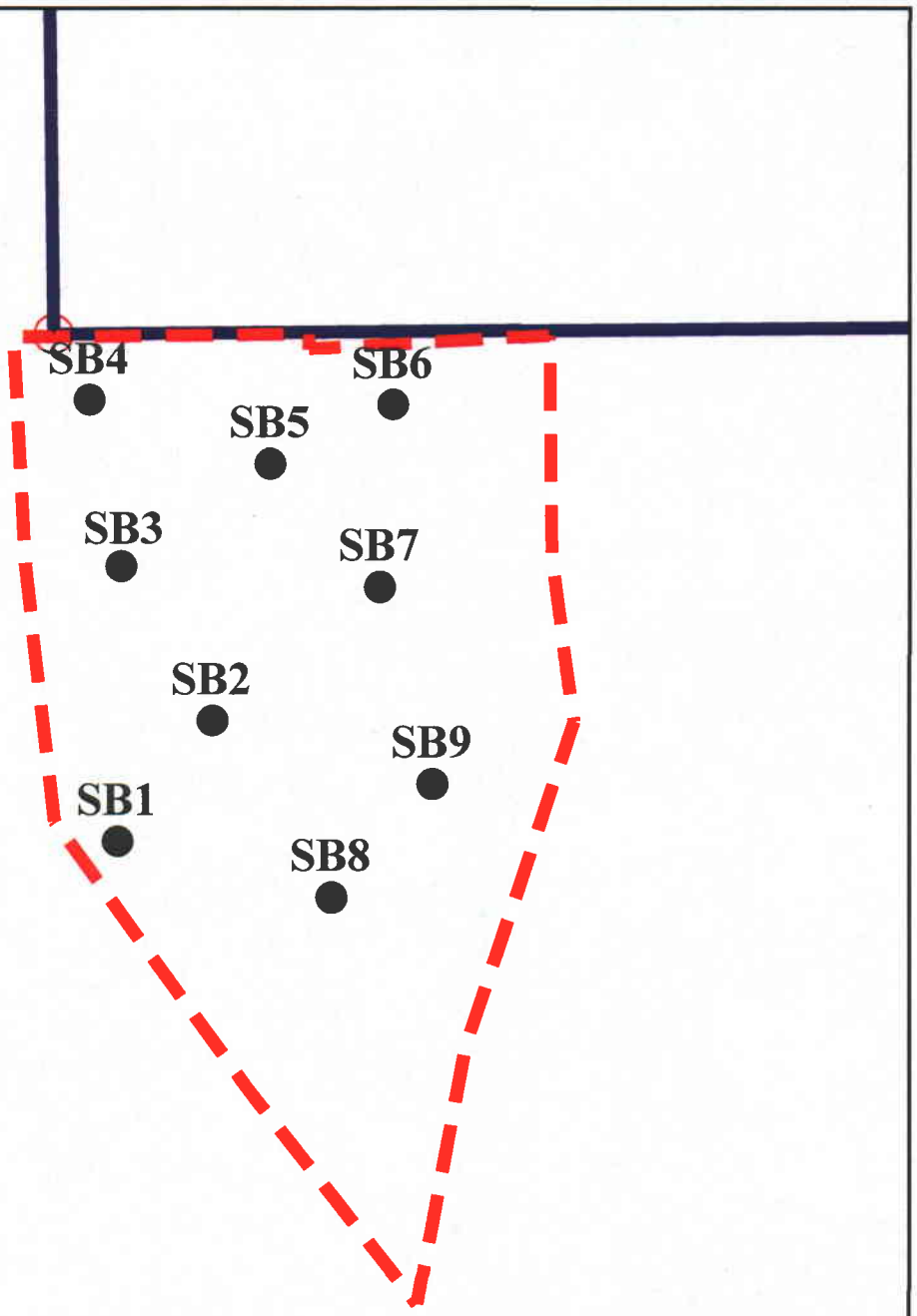
Canyon Fuel Company, LLC
Dugout Canyon Mine

SOIL BORROW AREA
FIGURE 1
RA ATTACHMENT 2-3

P.O BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER

SOIL BORROW AREA



SOIL BORROW AREA IS LOCATED IN SECTION 17, T14S R12E

REVISIONS OR UP-DATES			DATE: 1-19-06	
NO.	DATE	BY	DESIGNED BY:	
			DRAWN BY:	SC
			CHECKED BY:	
			SCALE: 1"=300'	

FILENAME: Y:\SAA\CAD\SURFACE\SOIL BORROW AREA WASTEROCKAREA FIG2

Canyon Fuel Company, LLC
Dugout Canyon Mine

BORROW AREA, SOIL PIT LOCATIONS

P.O BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER

APPENDIX B

Soil Analysis Report

r-Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel
P.O. Box 1029
Wellington, UT 84542

nt Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

d	Sample Id	Depths (Inches)	pH s.u.	Saturation %	EC @ 25°C dS/m	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR	Sand %	Silt %	Clay %	Texture
)9502	SB-1	0 - 5	7.6	33.1	0.38	2.64	0.93	0.24	0.18	33.0	45.0	22.0	LOAM
)9503	SB-1	5 - 13	7.8	37.3	0.33	1.34	0.71	1.19	1.17	26.0	48.0	26.0	LOAM
)9504	SB-1	13 - 32	7.9	40.4	2.12	7.85	5.07	10.7	4.20	37.0	41.0	22.0	LOAM
)9505	SB-1	32 - 54	7.6	37.9	4.83	25.8	16.9	17.5	3.78	36.0	38.0	26.0	LOAM
)9506	SB-1	54 - 78	7.7	35.5	4.00	20.6	24.0	9.25	1.96	42.0	42.0	16.0	LOAM
)9507	SB-2	0 - 8	7.7	31.4	0.39	3.15	0.67	0.33	0.24	47.0	37.0	16.0	LOAM
)9508	SB-2	8 - 15	7.7	29.7	0.30	2.89	0.73	0.26	0.20	50.0	30.0	20.0	LOAM
)9509	SB-2	15 - 26	7.8	30.2	0.22	1.57	0.42	0.46	0.46	43.0	37.0	20.0	LOAM
)9510	SB-2	26 - 48	7.7	46.4	0.83	6.30	1.51	1.01	0.51	14.0	58.0	28.0	SILTY CLAY LOA
)9511	SB-2	48 - 70	7.7	43.6	3.43	21.5	21.3	5.68	1.23	19.0	55.0	26.0	SILT LOAM
)9512	SB-3	0 - 6	7.8	30.6	0.46	3.03	1.20	0.27	0.19	40.0	42.0	18.0	LOAM
)9513	SB-3	6 - 18	7.9	35.9	0.33	1.54	0.91	1.00	0.91	35.0	39.0	26.0	LOAM
)9514	SB-3	18 - 38	8.2	38.0	1.05	1.81	0.92	7.50	6.42	36.0	42.0	22.0	LOAM
)9515	SB-3	38 - 45	7.8	25.0	4.19	19.5	10.7	24.7	6.36	72.0	15.0	13.0	SANDY LOAM
)9516	SB-3	45 - 72	7.6	33.4	2.46	12.5	7.17	5.25	1.67	40.0	41.0	19.0	LOAM
)9517	SB-4	0 - 5	7.8	36.6	0.42	2.14	0.82	0.71	0.58	30.0	44.0	26.0	LOAM
)9518	SB-4	5 - 18	8.2	32.5	0.35	1.00	0.47	1.87	2.18	43.0	37.0	20.0	LOAM
)9519	SB-4	18 - 31	8.4	36.0	0.63	0.96	0.54	4.36	5.04	38.0	41.0	21.0	LOAM
)9520	SB-4	31 - 44	7.9	26.3	4.52	19.1	22.5	17.0	3.72	70.0	14.0	16.0	SANDY LOAM
)9521	SB-4	44 - 64	7.7	33.4	4.57	21.7	18.3	16.1	3.59	42.0	38.0	20.0	LOAM
)9522	SB-5	0 - 12	7.9	28.0	0.30	1.98	0.68	0.47	0.41	50.0	32.0	18.0	LOAM
)9523	SB-5	12 - 30	8.3	35.3	0.59	1.04	0.65	4.06	4.42	31.0	47.0	22.0	LOAM
)9524	SB-5	30 - 56	7.8	36.2	5.65	21.9	19.3	24.3	5.35	39.0	37.0	24.0	LOAM
)9525	SB-5	56 - 68	7.9	32.8	5.39	21.4	29.3	18.9	3.75	44.0	38.0	18.0	LOAM
)9526	SB-6	0 - 8	8.0	32.0	0.67	2.12	1.03	2.51	2.00	48.0	36.0	16.0	LOAM
)9527	SB-6	8 - 17	8.3	31.5	0.53	1.23	0.50	3.74	4.02	52.0	30.0	18.0	SANDY LOAM
)9528	SB-6	17 - 29	8.2	31.3	0.42	0.96	0.37	2.96	3.63	38.0	38.0	24.0	LOAM

results only apply to the samples tested.

iations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
iations 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
aneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ved By: Joey Sheeley

Joey Sheeley, Soils Lab Supervisor

··Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel
P.O. Box 1029
Wellington, UT 84542

ıt Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

d	Sample Id	Depths (Inches)	Very Fine Sand %	Field Capacity %	Wilt Point %	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t
)9502	SB-1	0 - 5	20.9	23.1	9.5	0.3	<0.01	0.00	157	157
)9503	SB-1	5 - 13	23.2	25.4	12.8	0.3	0.01	0.31	167	166
)9504	SB-1	13 - 32	28.6	23.9	12.7	<0.1	<0.01	0.00	148	148
)9505	SB-1	32 - 54	27.6	24.8	12.4	0.2	0.44	13.7	141	127
)9506	SB-1	54 - 78	33.2	26.1	6.3	<0.1	0.01	0.31	154	153
)9507	SB-2	0 - 8	28.2	21.6	6.5	0.3	<0.01	0.00	136	136
)9508	SB-2	8 - 15	23.6	17.2	7.6	<0.1	0.01	0.31	146	145
)9509	SB-2	15 - 26	29.4	21.8	7.5	0.6	0.01	0.31	146	145
)9510	SB-2	26 - 48	13.4	29.4	16.1	0.9	0.01	0.31	180	180
)9511	SB-2	48 - 70	15.6	26.9	13.4	<0.1	0.30	9.37	163	154
)9512	SB-3	0 - 6	23.0	23.2	8.7	1.4	0.01	0.31	148	148
)9513	SB-3	6 - 18	24.3	22.8	10.6	0.2	<0.01	0.00	164	164
)9514	SB-3	18 - 38	24.8	21.0	11.3	0.3	0.01	0.31	146	146
)9515	SB-3	38 - 45	15.5	13.1	5.2	<0.1	<0.01	0.00	181	181
)9516	SB-3	45 - 72	24.5	24.5	7.5	0.2	0.01	0.31	159	158
)9517	SB-4	0 - 5	21.9	24.8	11.4	0.3	0.01	0.31	164	164
)9518	SB-4	5 - 18	22.7	23.0	9.4	0.3	<0.01	0.00	165	165
)9519	SB-4	18 - 31	26.7	22.2	11.5	0.2	<0.01	0.00	155	155
)9520	SB-4	31 - 44	13.5	17.3	5.9	<0.1	<0.01	0.00	184	184
)9521	SB-4	44 - 64	28.2	25.0	8.6	0.2	<0.01	0.00	154	154
)9522	SB-5	0 - 12	24.1	19.0	7.3	0.3	0.01	0.31	165	165
)9523	SB-5	12 - 30	21.5	22.9	10.0	0.3	0.01	0.31	144	144
)9524	SB-5	30 - 56	25.4	24.3	11.0	0.2	0.36	11.2	155	144
)9525	SB-5	56 - 68	28.8	23.3	8.7	0.1	0.32	10.0	139	129
)9526	SB-6	0 - 8	31.3	20.0	8.8	0.4	0.01	0.31	166	165
)9527	SB-6	8 - 17	28.7	17.4	9.0	0.4	<0.01	0.00	158	158
)9528	SB-6	17 - 29	21.1	19.1	11.3	0.2	0.02	0.62	155	154

results only apply to the samples tested.

riations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
riations 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
laneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ved By: Joey Shelley

Joey Shelley, Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

ıt Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

d	Sample Id	Depths (Inches)	Boron ppm	Nitrogen Nitrate ppm	TKN %	Selenium ppm	Available Sodium meq/100g	Exchangeable Sodium meq/100g
)9502	SB-1	0 - 5	0.24	1.22	0.09	<0.02	0.10	0.09
)9503	SB-1	5 - 13	0.45	0.26	0.13	<0.02	0.26	0.22
)9504	SB-1	13 - 32	0.67	0.02	0.08	<0.02	1.24	0.81
)9505	SB-1	32 - 54	0.55	0.36	0.09	0.14	1.51	0.85
)9506	SB-1	54 - 78	0.41	1.70	0.06	0.16	0.73	0.40
)9507	SB-2	0 - 8	0.12	0.90	0.08	<0.02	0.09	0.08
)9508	SB-2	8 - 15	0.17	0.40	0.09	<0.02	0.08	0.07
)9509	SB-2	15 - 26	0.12	0.24	0.06	<0.02	0.13	0.12
)9510	SB-2	26 - 48	0.26	0.16	0.09	<0.02	0.22	0.17
)9511	SB-2	48 - 70	1.14	0.26	0.05	0.10	0.60	0.35
)9512	SB-3	0 - 6	0.19	3.34	0.06	<0.02	0.08	0.07
)9513	SB-3	6 - 18	0.29	0.18	0.08	<0.02	0.39	0.35
)9514	SB-3	18 - 38	0.31	0.78	0.08	<0.02	1.61	1.33
)9515	SB-3	38 - 45	0.22	3.02	0.07	0.02	1.34	0.72
)9516	SB-3	45 - 72	0.23	0.94	0.04	0.02	0.50	0.32
)9517	SB-4	0 - 5	0.18	2.46	0.09	<0.02	0.16	0.13
)9518	SB-4	5 - 18	0.32	0.32	0.07	<0.02	0.52	0.46
)9519	SB-4	18 - 31	0.33	0.18	0.10	<0.02	1.27	1.11
)9520	SB-4	31 - 44	0.43	0.40	0.06	0.04	1.05	0.60
)9521	SB-4	44 - 64	0.25	0.32	0.06	0.02	1.26	0.72
)9522	SB-5	0 - 12	0.24	0.42	0.04	<0.02	0.10	0.09
)9523	SB-5	12 - 30	0.32	<0.02	0.08	<0.02	1.10	0.96
)9524	SB-5	30 - 56	0.60	0.18	0.05	0.04	2.02	1.14
)9525	SB-5	56 - 68	0.51	0.24	0.04	0.28	1.34	0.72
)9526	SB-6	0 - 8	0.25	0.76	0.06	<0.02	0.38	0.30
)9527	SB-6	8 - 17	0.31	0.28	0.06	<0.02	0.80	0.68
)9528	SB-6	17 - 29	0.25	0.10	0.05	<0.02	0.95	0.86

results only apply to the samples tested.

ıiations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

ıiations 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

laneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ıed By: Joey Shelley

Joey [redacted] Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

i	Sample Id	Depths (Inches)	pH s.u.	Saturation %	EC @ 25°C dS/m	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR	Sand %	Silt %	Clay %	Texture
9529	SB-6	29 - 48	7.9	36.8	4.51	19.6	13.3	23.7	5.86	39.0	39.0	22.0	LOAM
9530	SB-6	48 - 68	7.9	33.9	8.38	20.9	48.8	42.4	7.19	39.0	37.0	24.0	LOAM
9531	SB-7	0 - 3	7.9	29.6	0.80	4.46	1.41	1.44	0.84	49.0	38.0	13.0	LOAM
9532	SB-7	3 - 8	8.0	31.1	0.30	1.56	0.64	0.54	0.52	40.0	40.0	20.0	LOAM
9533	SB-7	8 - 23	8.2	29.7	0.41	1.15	0.59	2.13	2.28	39.0	43.0	18.0	LOAM
9534	SB-7	23 - 50	8.0	25.6	4.76	15.8	12.1	29.6	7.93	63.0	19.0	18.0	SANDY LOAM
9535	SB-7	50 - 72	7.8	33.5	5.85	18.8	24.0	30.7	6.64	40.0	36.0	24.0	LOAM
9536	SB-8	0 - 8	7.8	29.0	0.36	2.49	1.01	0.54	0.41	48.0	32.0	20.0	LOAM
9537	SB-8	8 - 16	8.0	31.3	0.28	1.73	0.76	0.44	0.39	43.0	38.0	19.0	LOAM
9538	SB-8	16 - 39	7.8	37.5	2.24	18.9	9.22	3.04	0.81	35.0	41.0	24.0	LOAM
9539	SB-8	39 - 47	7.7	23.8	2.75	21.0	10.7	5.66	1.42	69.0	19.0	12.0	SANDY LOAM
9540	SB-8	47 - 72	7.6	36.9	3.06	22.4	10.9	6.64	1.63	34.0	40.0	26.0	LOAM
9541	SB-9	0 - 7	7.9	38.5	0.37	2.37	0.91	0.43	0.34	30.0	44.0	26.0	LOAM
9542	SB-9	7 - 20	8.3	39.0	0.33	0.90	0.49	2.05	2.46	31.0	47.0	22.0	LOAM
9543	SB-9	20 - 36	8.3	36.3	1.90	2.12	2.91	11.3	7.12	32.0	48.0	20.0	LOAM
9544	SB-9	36 - 72	8.3	34.0	12.2	16.9	63.2	75.5	11.9	42.0	37.0	21.0	LOAM

esults only apply to the samples tested.

ations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
ations 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
ıneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ed By: Joey Shurley

Joey S[redacted] Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

i	Sample Id	Depths (Inches)	Very Fine Sand %	Field Capacity %	Wilt Point %	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S, ABP t/1000t
9529	SB-6	29 - 48	24.9	23.6	12.6	0.2	0.12	3.75	127	124
9530	SB-6	48 - 68	23.9	24.2	11.1	0.2	0.28	8.75	143	134
9531	SB-7	0 - 3	30.8	20.8	6.9	0.5	0.01	0.31	153	153
9532	SB-7	3 - 8	26.2	21.9	10.3	0.3	0.01	0.31	163	162
9533	SB-7	8 - 23	24.6	21.2	9.4	0.3	0.01	0.31	168	168
9534	SB-7	23 - 50	12.4	15.1	7.5	<0.1	<0.01	0.00	197	197
9535	SB-7	50 - 72	21.0	21.6	11.1	0.2	0.02	0.62	141	140
9536	SB-8	0 - 8	27.8	21.1	8.9	1.2	<0.01	0.00	168	168
9537	SB-8	8 - 16	28.1	23.2	9.9	0.3	0.01	0.31	155	155
9538	SB-8	16 - 39	26.9	25.3	12.3	0.3	0.01	0.31	139	139
9539	SB-8	39 - 47	16.1	14.5	5.8	<0.1	0.03	0.94	195	194
9540	SB-8	47 - 72	24.3	26.3	11.8	0.3	0.02	0.62	146	145
9541	SB-9	0 - 7	21.0	24.3	12.2	0.4	<0.01	0.00	153	153
9542	SB-9	7 - 20	21.4	23.4	13.1	0.3	0.01	0.31	163	162
9543	SB-9	20 - 36	21.3	22.9	12.1	<0.1	<0.01	0.00	162	162
9544	SB-9	36 - 72	23.1	22.5	11.2	0.1	0.33	10.3	150	139

esults only apply to the samples tested.

iations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

iations 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

aneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ved By: Joey Shelley

Joey [redacted] Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

l	Sample Id	Depths (Inches)	Boron ppm	Nitrogen Nitrate ppm	TKN %	Selenium ppm	Available Sodium meq/100g	Exchangeable Sodium meq/100g
9529	SB-6	29 - 48	0.65	0.18	0.07	<0.02	2.08	1.21
9530	SB-6	48 - 68	0.59	0.48	0.05	0.04	2.86	1.42
9531	SB-7	0 - 3	0.24	8.10	0.08	<0.02	0.15	0.11
9532	SB-7	3 - 8	0.23	2.04	0.06	<0.02	0.12	0.10
9533	SB-7	8 - 23	0.30	0.40	0.08	<0.02	0.40	0.34
9534	SB-7	23 - 50	0.30	1.12	0.04	0.02	1.71	0.95
9535	SB-7	50 - 72	0.16	2.24	0.01	<0.02	2.45	1.42
9536	SB-8	0 - 8	0.13	0.74	0.05	<0.02	0.07	0.05
9537	SB-8	8 - 16	0.23	0.22	0.06	<0.02	0.12	0.11
9538	SB-8	16 - 39	0.38	<0.02	0.06	<0.02	0.35	0.24
9539	SB-8	39 - 47	0.13	1.04	0.06	0.02	0.36	0.23
9540	SB-8	47 - 72	0.27	0.50	0.04	0.14	0.64	0.39
9541	SB-9	0 - 7	0.29	1.32	0.09	<0.02	0.11	0.09
9542	SB-9	7 - 20	0.35	<0.02	0.07	<0.02	0.54	0.46
9543	SB-9	20 - 36	0.24	0.08	0.10	0.02	1.79	1.38
9544	SB-9	36 - 72	0.31	0.34	0.05	0.10	5.61	3.04

esults only apply to the samples tested.

ations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
ations 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
ıneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ed By: Joey Shirley

Joey S[redacted] Soils Lab Supervisor

APPENDIX C

Soil Suitability Ratings

Table 4. Soil and Spoil Suitability/Unsuitability Evaluation

CRITERIA	GOOD	FAIR	POOR	UNACCEPTABLE
Saturation %	25 to 55	≥56 - 80	<25 >80	
pH	6.5 to 8.2	6.0 to 6.4 8.2 to 8.5	5.5 to 6.0 8.6 to 9.0	< 5.5 > 9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	> 15
SAR [a,b]	0 to 4	5 to 10	10 to 14	> 14
%$CaCO_3$	<15	15 - 30	>30	
Texture [c]	sl, l, sil, scl, vfsl, fsl	c, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			10%
Available Water Capacity[d]	> 0.10 moderate	0.05 to 0.10 low	< 0.05 very low	
K factor[e]	< 0.37	0.37	> 0.37	

[a] For clay textured soils unacceptable is SAR >14. For sandy textured soils unacceptable is >20.

[b] For most Western soils, the SAR to ESP relationship is usually 1:1, up to ESP ≈ 20. If SAR>20, then determine ESP. (Evangelou, 2000.)

[c] s=sand, l= loam, si= silt, c= clay, v= very, f= fine, co=coarse, g=gravel

[d] Available Water Capacity is adjusted for texture and SAR.

[e] K factor recommendations from the USDA Soil Conservation Service.1978. National Soils Handbook Notice 24. (3/31/78). NSH Part II –403.6(a). For Prime Farmland soils, the K factor times the percent slope should be a value of five or less for minimal erosion hazard.

Table 9. Acidity/Toxicity Evaluation

PARAMETERS	UNACCEPTABLE LEVELS
Soluble Selenium	≥ 0.15 mg/kg [1] ≥0.10 mg/kg [2,3]
Available Boron	≥5.0 mg/kg
Acid/Base Potential	≤ 0 tons $CaCO_3$ /1000 tons overburden

[1] unacceptable level for the rooting zone (top four feet of fill) and/or ephemeral drainages with 100 year flood plains, top 4 feet fill

[2] unacceptable level for the top 4 feet of fill in surface-water impoundments.

[3] unacceptable level for intermittent/perennial drainages including 100 year flood plains

Ref: Guidelines for Management of Topsoil and Overburden, R645-301-200 SOILS, Utah Division of Oil, Gas and Mining, Draft June 2003

r·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Copy with suitability notes

Soil Analysis Report
Canyon Fuel Co
Dugout Mine -Canyon Fuel
P.O. Box 1029
Wellington, UT 84542

Ratings are good for selected parameters unless noted as Fair, poor, or unacceptable

nt Project ID: Dugout Canyon
Received: 10/12/05

Set #0105S09502
Report Date: 11/17/05

d	Sample Id	Depths (Inches)	pH s.u.	Saturation %	EC @ 25°C dS/m	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR	Sand %	Silt %	Clay %	Texture
)9502	SB-1	0 - 5	7.6	33.1	0.38	2.64	0.93	0.24	0.18	33.0	45.0	22.0	LOAM
)9503	SB-1	5 - 13	7.8	37.3	0.33	1.34	0.71	1.19	1.17	26.0	48.0	26.0	LOAM
)9504	SB-1	13 - 32	7.9	40.4	2.12	7.85	5.07	10.7	4.20 F	37.0	41.0	22.0	LOAM
)9505	SB-1	32 - 54	7.6	37.9	4.83 F	25.8	16.9	17.5	3.78	36.0	38.0	26.0	LOAM
)9506	SB-1	54 - 78	7.7	35.5	4.00 F	20.6	24.0	9.25	1.96	42.0	42.0	16.0	LOAM
)9507	SB-2	0 - 8	7.7	31.4	0.39	3.15	0.67	0.33	0.24	47.0	37.0	16.0	LOAM
)9508	SB-2	8 - 15	7.7	29.7	0.30	2.89	0.73	0.26	0.20	50.0	30.0	20.0	LOAM
)9509	SB-2	15 - 26	7.8	30.2	0.22	1.57	0.42	0.46	0.46	43.0	37.0	20.0	LOAM
)9510	SB-2	26 - 48	7.7	46.4	0.83	6.30	1.51	1.01	0.51	14.0	58.0	28.0	SILTY CLAY LOAM (F)
)9511	SB-2	48 - 70	7.7	43.6	3.43	21.5	21.3	5.68	1.23	19.0	55.0	26.0	SILT LOAM
)9512	SB-3	0 - 6	7.8	30.6	0.46	3.03	1.20	0.27	0.19	40.0	42.0	18.0	LOAM
)9513	SB-3	6 - 18	7.9	35.9	0.33	1.54	0.91	1.00	0.91	35.0	39.0	26.0	LOAM
)9514	SB-3	18 - 38	8.2 F	38.0	1.05	1.81	0.92	7.50	6.42 F	36.0	42.0	22.0	LOAM
)9515	SB-3	38 - 45	7.8	25.0	4.19 F	19.5	10.7	24.7	6.36 F	72.0	15.0	13.0	SANDY LOAM
)9516	SB-3	45 - 72	7.6	33.4	2.46	12.5	7.17	5.25	1.67	40.0	41.0	19.0	LOAM
)9517	SB-4	0 - 5	7.8	36.6	0.42	2.14	0.82	0.71	0.58	30.0	44.0	26.0	LOAM
)9518	SB-4	5 - 18	8.2 F	32.5	0.35	1.00	0.47	1.87	2.18	43.0	37.0	20.0	LOAM
)9519	SB-4	18 - 31	8.4 F	36.0	0.63	0.96	0.54	4.36	5.04 F	38.0	41.0	21.0	LOAM
)9520	SB-4	31 - 44	7.9	26.3	4.52 F	19.1	22.5	17.0	3.72	70.0	14.0	16.0	SANDY LOAM
)9521	SB-4	44 - 64	7.7	33.4	4.57 F	21.7	18.3	16.1	3.59	42.0	38.0	20.0	LOAM
)9522	SB-5	0 - 12	7.9	28.0	0.30	1.98	0.68	0.47	0.41	50.0	32.0	18.0	LOAM
)9523	SB-5	12 - 30	8.3 F	35.3	0.59	1.04	0.65	4.06	4.42	31.0	47.0	22.0	LOAM
)9524	SB-5	30 - 56	7.8	36.2	5.65 F	21.9	19.3	24.3	5.35 F	39.0	37.0	24.0	LOAM
)9525	SB-5	56 - 68	7.9	32.8	5.39 F	21.4	29.3	18.9	3.75	44.0	38.0	18.0	LOAM
)9526	SB-6	0 - 8	8.0	32.0	0.67	2.12	1.03	2.51	2.00	48.0	36.0	16.0	LOAM
)9527	SB-6	8 - 17	8.3 F	31.5	0.53	1.23	0.50	3.74	4.02	52.0	30.0	18.0	SANDY LOAM
)9528	SB-6	17 - 29	8.2 F	31.3	0.42	0.96	0.37	2.96	3.63	38.0	38.0	24.0	LOAM

All Good

results only apply to the samples tested. 6.5-8.1 = Good; 8.2-8.5 = Fair; <4 = Good; 4 to 8 = Fair; <4 = Good; 5 to 10 = Fair; L + SL = Good; SCL = Fair

iations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
iations 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
aneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ved By: Joey Shelley
Joey Shelley, Soils Lab Supervisor

··Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

ort ID: 010509502

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

nt Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

AWC = FC − WP

vfs acts like silt
very fine sand content is high

d	Sample Id	Depths (Inches)	Very Fine Sand %	Field Capacity %	Avail Water Cap %	Wilt Point %	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t	Very fine sand + silt %	Total sand minus vfs %	Particle Size Class
09502	SB-1	0 - 5	20.9	23.1	11.4	9.5	0.3	<0.01	0.00	157	157	65.9	12.1	Fine silty
09503	SB-1	5 - 13	23.2	25.4	12.6	12.8	0.3	0.01	0.31	167	166	71.2	2.8	Fine silty
09504	SB-1	13 - 32	28.6	23.9	11.2	12.7	<0.1	<0.01	0.00	148	148	69.6	8.4	Fine silty
09505	SB-1	32 - 54	27.6	24.8	12.4	12.4	0.2	0.44	13.7	141	127	65.2	8.4	Fine silty
09506	SB-1	54 - 78	33.2	26.1	19.8	6.3	<0.1	0.01	0.31	154	153	75.2	8.8	Coarse silty
09507	SB-2	0 - 8	28.2	21.6	15.1	6.5	0.3	<0.01	0.00	136	136	65.2	18.8	Fine silty
09508	SB-2	8 - 15	23.6	17.2	9.6 F	7.6	<0.1	0.01	0.31	146	145	53.6	26.4	Fine loamy
09509	SB-2	15 - 26	29.4	21.8	14.3	7.5	0.6	0.01	0.31	146	145	66.4	13.6	Fine silty
09510	SB-2	26 - 48	13.4	29.4	13.3	16.1	0.9	0.01	0.31	180	180	71.4	8.6	Fine silty
09511	SB-2	48 - 70	15.6	26.9	13.5	13.4	<0.1	0.30	9.37	163	154	70.6	3.4	Fine silty
09512	SB-3	0 - 6	23.0	23.2	14.5	8.7	1.4	0.01	0.31	148	148	65.0	17.0	Fine loamy
09513	SB-3	6 - 18	24.3	22.8	12.2	10.6	0.2	<0.01	0.00	164	164	63.3	10.7	Fine silty
09514	SB-3	18 - 38	24.8	21.0	9.7 F	11.3	0.3	0.01	0.31	146	146	66.8	11.2	Fine silty
09515	SB-3	38 - 45	15.5	13.1	7.9 F	5.2	<0.1	<0.01	0.00	181	181	30.5	56.5	Coarse loamy
09516	SB-3	45 - 72	24.5	24.5	17.0	7.5	0.2	0.01	0.31	159	158	65.5	15.5	Fine loamy
09517	SB-4	0 - 5	21.9	24.8	13.4	11.4	0.3	0.01	0.31	164	164	65.9	8.1	Fine silty
09518	SB-4	5 - 18	22.7	23.0	13.6	9.4	0.3	<0.01	0.00	165	165	59.7	20.3	Fine loamy
09519	SB-4	18 - 31	26.7	22.2	10.7	11.5	0.2	<0.01	0.00	155	155	67.7	11.3	Fine silty
09520	SB-4	31 - 44	13.5	17.3	11.4	5.9	<0.1	<0.01	0.00	184	184	27.5	56.5	Coarse loamy
09521	SB-4	44 - 64	28.2	25.0	16.4	8.6	0.2	<0.01	0.00	154	154	66.2	13.8	Fine silty
09522	SB-5	0 - 12	24.1	19.0	11.7	7.3	0.3	0.01	0.31	165	165	56.1	25.9	Fine loamy
09523	SB-5	12 - 30	21.5	22.9	12.9	10.0	0.3	0.01	0.31	144	144	68.5	9.5	Fine silty
09524	SB-5	30 - 56	25.4	24.3	13.3	11.0	0.2	0.36	11.2	155	144	62.4	13.6	Fine silty
09525	SB-5	56 - 68	28.8	23.3	14.6	8.7	0.1	0.32	10.0	139	129	66.8	15.2	Fine loamy
09526	SB-6	0 - 8	31.3	20.0	11.2	8.8	0.4	0.01	0.31	166	165	67.3	16.7	Coarse loamy
09527	SB-6	8 - 17	28.7	17.4	8.4 F	9.0	0.4	<0.01	0.00	158	158	58.7	23.3	Fine loamy/c.l.
09528	SB-6	17 - 29	21.1	19.1	7.8 F	11.3	0.2	0.02	0.62	155	154	59.1	16.9	Fine loamy

All acceptable

results only apply to the samples tested.

>10% = Good
5 to 10% = Fair
<10% = Good

iations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

iations 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

laneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

wed By: Joe Shelley

Joe Shelley, Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

ıt Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

d	Sample Id	Depths (Inches)	Boron ppm	Nitrogen Nitrate ppm	TKN %	Selenium ppm	Available Sodium meq/100g	Exchangeable Sodium meq/100g
)9502	SB-1	0 - 5	0.24	1.22	0.09	<0.02	0.10	0.09
)9503	SB-1	5 - 13	0.45	0.26	0.13	<0.02	0.26	0.22
)9504	SB-1	13 - 32	0.67	0.02	0.08	<0.02	1.24	0.81
)9505	SB-1	32 - 54	0.55	0.36	0.09	*High 0.14	1.51	0.85
)9506	SB-1	54 - 78	0.41	1.70	0.06	0.16 *U	0.73	0.40
)9507	SB-2	0 - 8	0.12	0.90	0.08	<0.02	0.09	0.08
)9508	SB-2	8 - 15	0.17	0.40	0.09	<0.02	0.08	0.07
)9509	SB-2	15 - 26	0.12	0.24	0.06	<0.02	0.13	0.12
)9510	SB-2	26 - 48	0.26	0.16	0.09	<0.02	0.22	0.17
)9511	SB-2	48 - 70	1.14	0.26	0.05	0.10	0.60	0.35
)9512	SB-3	0 - 6	0.19	3.34	0.06	<0.02	0.08	0.07
)9513	SB-3	6 - 18	0.29	0.18	0.08	<0.02	0.39	0.35
)9514	SB-3	18 - 38	0.31	0.78	0.08	<0.02	1.61	1.33
)9515	SB-3	38 - 45	0.22	3.02	0.07	0.02	1.34	0.72
)9516	SB-3	45 - 72	0.23	0.94	0.04	0.02	0.50	0.32
)9517	SB-4	0 - 5	0.18	2.46	0.09	<0.02	0.16	0.13
)9518	SB-4	5 - 18	0.32	0.32	0.07	<0.02	0.52	0.46
)9519	SB-4	18 - 31	0.33	0.18	0.10	<0.02	1.27	1.11
)9520	SB-4	31 - 44	0.43	0.40	0.06	0.04	1.05	0.60
)9521	SB-4	44 - 64	0.25	0.32	0.06	0.02	1.26	0.72
)9522	SB-5	0 - 12	0.24	0.42	0.04	<0.02	0.10	0.09
)9523	SB-5	12 - 30	0.32	<0.02	0.08	<0.02	1.10	0.96
)9524	SB-5	30 - 56	0.60	0.18	0.05	0.04	2.02	1.14
)9525	SB-5	56 - 68	0.51	0.24	0.04	0.28 *U	1.34	0.72
)9526	SB-6	0 - 8	0.25	0.76	0.06	<0.02	0.38	0.30
)9527	SB-6	8 - 17	0.31	0.28	0.06	<0.02	0.80	0.68
)9528	SB-6	17 - 29	0.25	0.10	0.05	<0.02	0.95	0.86

results only apply to the samples tested. All acceptable C < 5.0

*U= Unacceptable > 0.15

riations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

riations 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

laneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

wed By: Joey Shelley

Jo[redacted]low, Soils Lab Supervisor

·Mountain Laboratories, Inc.

ɔrt ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

ı	Sample Id	Depths (Inches)	pH s.u.	Saturation %	EC @ 25°C dS/m	Calcium meq/L	Magnesium meq/L	Sodium meq/L	SAR	Sand %	Silt %	Clay %	Texture
9529	SB-6	29 - 48	7.9	36.8	4.51 F	19.6	13.3	23.7	5.86 F	39.0	39.0	22.0	LOAM
9530	SB-6	48 - 68	7.9	33.9	8.38 P*	20.9	48.8	42.4	7.19 F	39.0	37.0	24.0	LOAM
9531	SB-7	0 - 3	7.9	29.6	0.80	4.46	1.41	1.44	0.84	49.0	38.0	13.0	LOAM
9532	SB-7	3 - 8	8.0	31.1	0.30	1.56	0.64	0.54	0.52	40.0	40.0	20.0	LOAM
9533	SB-7	8 - 23	8.2 F	29.7	0.41	1.15	0.59	2.13	2.28	39.0	43.0	18.0	LOAM
9534	SB-7	23 - 50	8.0	25.6	4.76 F	15.8	12.1	29.6	7.93 F	63.0	19.0	18.0	SANDY LOAM
9535	SB-7	50 - 72	7.8	33.5	5.85 F	18.8	24.0	30.7	6.64 F	40.0	36.0	24.0	LOAM
9536	SB-8	0 - 8	7.8	29.0	0.36	2.49	1.01	0.54	0.41	48.0	32.0	20.0	LOAM
9537	SB-8	8 - 16	8.0	31.3	0.28	1.73	0.76	0.44	0.39	43.0	38.0	19.0	LOAM
9538	SB-8	16 - 39	7.8	37.5	2.24	18.9	9.22	3.04	0.81	35.0	41.0	24.0	LOAM
9539	SB-8	39 - 47	7.7	23.8 P*	2.75	21.0	10.7	5.66	1.42	69.0	19.0	12.0	SANDY LOAM
9540	SB-8	47 - 72	7.6	36.9	3.06	22.4	10.9	6.64	1.63	34.0	40.0	26.0	LOAM
9541	SB-9	0 - 7	7.9	38.5	0.37	2.37	0.91	0.43	0.34	30.0	44.0	26.0	LOAM
9542	SB-9	7 - 20	8.3 F	39.0	0.33	0.90	0.49	2.05	2.46	31.0	47.0	22.0	LOAM
9543	SB-9	20 - 36	8.3 F	36.3	1.90	2.12	2.91	11.3	7.12 F	32.0	48.0	20.0	LOAM
9544	SB-9	36 - 72	8.3 F	34.0	12.2 P*	16.9	63.2	75.5	11.9 P*	42.0	37.0	21.0	LOAM

6.5 To 8.1 = Good
8.2 To 8.5 = Fair

< 4 = Good
4 To 8 = Fair
8 To 15 = Poor

< 4 = Good
5 To 10 = Fair
10 To 14 = Poor

L + SL = Good

Saturation %
< 25 = Poor
25 To 55 is Good

esults only apply to the samples tested.

ations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
ations 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
ıneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ed By: Joey Shurley

Joey Shurley, Soils Lab Supervisor

·Mountain Laboratories, Inc.

ort ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

AWC = FC - WP

i	Sample Id	Depths (Inches)	Very Fine Sand %	Field Capacity %	Avail. Water Cap %	Wilt Point %	TOC %	Total Sulfur %	T.S. AB t/1000t	Neutral. Pot. t/1000t	T.S. ABP t/1000t	Very Fine Sand + Silt %	Total Sand − VFS %	Particle Size Class
9529	SB-6	29 - 48	24.9	23.6	11.0	12.6	0.2	0.12	3.75	127	124	63.9	14.1	Fine silty
9530	SB-6	48 - 68	23.9	24.2	13.1	11.1	0.2	0.28	8.75	143	134	60.9	15.1	Fine loamy
9531	SB-7	0 - 3	30.8	20.8	13.9	6.9	0.5	0.01	0.31	153	153	68.8	18.2	Coarse loamy
9532	SB-7	3 - 8	26.2	21.9	11.6	10.3	0.3	0.01	0.31	163	162	66.2	15.4	Coarse loamy
9533	SB-7	8 - 23	24.6	21.2	11.8	9.4	0.3	0.01	0.31	168	168	67.6	14.4	Fine silty
9534	SB-7	23 - 50	12.4	15.1	7.6 F	7.5	<0.1	<0.01	0.00	197	197	31.4	50.6	Coarse loamy /F.L at border
9535	SB-7	50 - 72	21.0	21.6	10.5	11.1	0.2	0.02	0.62	141	140	57.0	19.0	Fine loamy
9536	SB-8	0 - 8	27.8	21.1	12.2	8.9	1.2	<0.01	0.00	168	168	59.8	20.2	Fine loamy
9537	SB-8	8 - 16	28.1	23.2	13.3	9.9	0.3	0.01	0.31	155	155	66.1	14.9	Fine silty
9538	SB-8	16 - 39	26.9	25.3	13.0	12.3	0.3	0.01	0.31	139	139	67.9	8.1	Fine silty
9539	SB-8	39 - 47	16.1	14.5	8.7 F	5.8	<0.1	0.03	0.94	195	194	35.1	52.9	Coarse loamy
9540	SB-8	47 - 72	24.3	26.3	14.5	11.8	0.3	0.02	0.62	146	145	64.3	9.7	Fine silty
9541	SB-9	0 - 7	21.0	24.3	12.1	12.2	0.4	<0.01	0.00	153	153	65.0	9.0	Fine silty
9542	SB-9	7 - 20	21.4	23.4	10.3	13.1	0.3	0.01	0.31	163	162	68.4	9.6	Fine silty
9543	SB-9	20 - 36	21.3	22.9	10.8	12.1	<0.1	<0.01	0.00	162	162	69.3	10.7	Fine silty
9544	SB-9	36 - 72	23.1	22.5	11.3	11.2	0.1	0.33	10.3	150	139	60.1	13.9	Fine silty

Very fine sand is a high proportion of the total sand in most of these soils. It is grouped with silt for many interpretations

AWC
>10% = Good
5 to 10% = Fair

All acceptable
> 0

esults only apply to the samples tested.

iations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
iations 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
aneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ved By: Joey Shelley

Joey Shelley, Soils Lab Supervisor

·Mountain Laboratories, Inc.

ırt ID: 010509502

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Canyon Fuel Co

Dugout Mine -Canyon Fuel

P.O. Box 1029

Wellington, UT 84542

t Project ID: Dugout Canyon

Received: 10/12/05

Set #0105S09502

Report Date: 11/17/05

l	Sample Id	Depths (Inches)	Boron ppm	Nitrogen Nitrate ppm	TKN %	Selenium ppm	Available Sodium meq/100g	Exchangeable Sodium meq/100g
9529	SB-6	29 - 48	0.65	0.18	0.07	<0.02	2.08	1.21
9530	SB-6	48 - 68	0.59	0.48	0.05	0.04	2.86	1.42
9531	SB-7	0 - 3	0.24	8.10	0.08	<0.02	0.15	0.11
9532	SB-7	3 - 8	0.23	2.04	0.06	<0.02	0.12	0.10
9533	SB-7	8 - 23	0.30	0.40	0.08	<0.02	0.40	0.34
9534	SB-7	23 - 50	0.30	1.12	0.04	0.02	1.71	0.95
9535	SB-7	50 - 72	0.16	2.24	0.01	<0.02	2.45	1.42
9536	SB-8	0 - 8	0.13	0.74	0.05	<0.02	0.07	0.05
9537	SB-8	8 - 16	0.23	0.22	0.06	<0.02	0.12	0.11
9538	SB-8	16 - 39	0.38	<0.02	0.06	<0.02	0.35	0.24
9539	SB-8	39 - 47	0.13	1.04	0.06	0.02	0.36	0.23
9540	SB-8	47 - 72	0.27	0.50	0.04	0.14 ✓	0.64	0.39
9541	SB-9	0 - 7	0.29	1.32	0.09	<0.02	0.11	0.09
9542	SB-9	7 - 20	0.35	<0.02	0.07	<0.02	0.54	0.46
9543	SB-9	20 - 36	0.24	0.08	0.10	0.02	1.79	1.38
9544	SB-9	36 - 72	0.31	0.34	0.05	0.10	5.61	3.04

All acceptable @ < 5.0

.014 is high but not unacceptable U = > 0.15

esults only apply to the samples tested.

ations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

ations 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

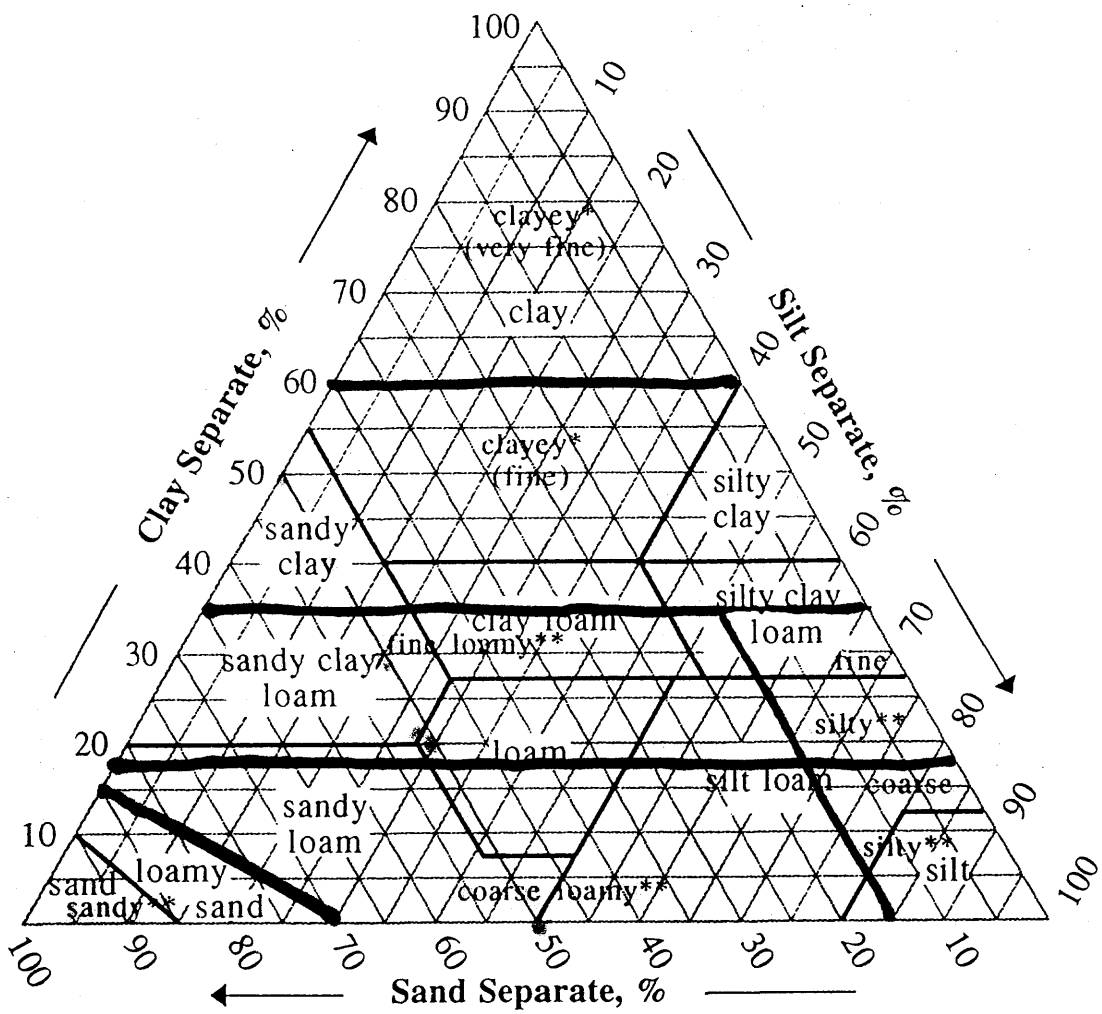
ıneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

ed By: Joey Shurley

Joey Shurley, Soils Lab Supervisor

APPENDIX IV

GUIDE FOR TEXTURAL CLASSIFICATION IN SOIL FAMILIES



* Clay-size carbonate is treated as silt.

** Very fine sand (0.05 - 0.1 is treated as silt for family groupings; coarse fragments are considered the equivalent of coarse sand in the boundary between the silty and loamy classes.

COMPARISON OF PARTICLE SIZE SCALES

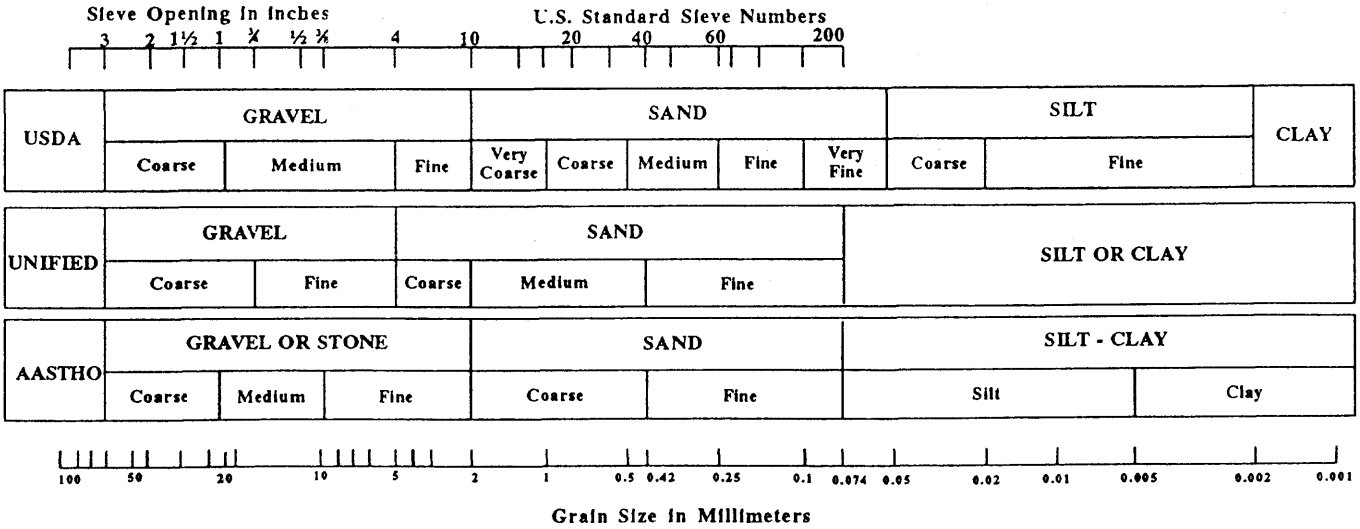
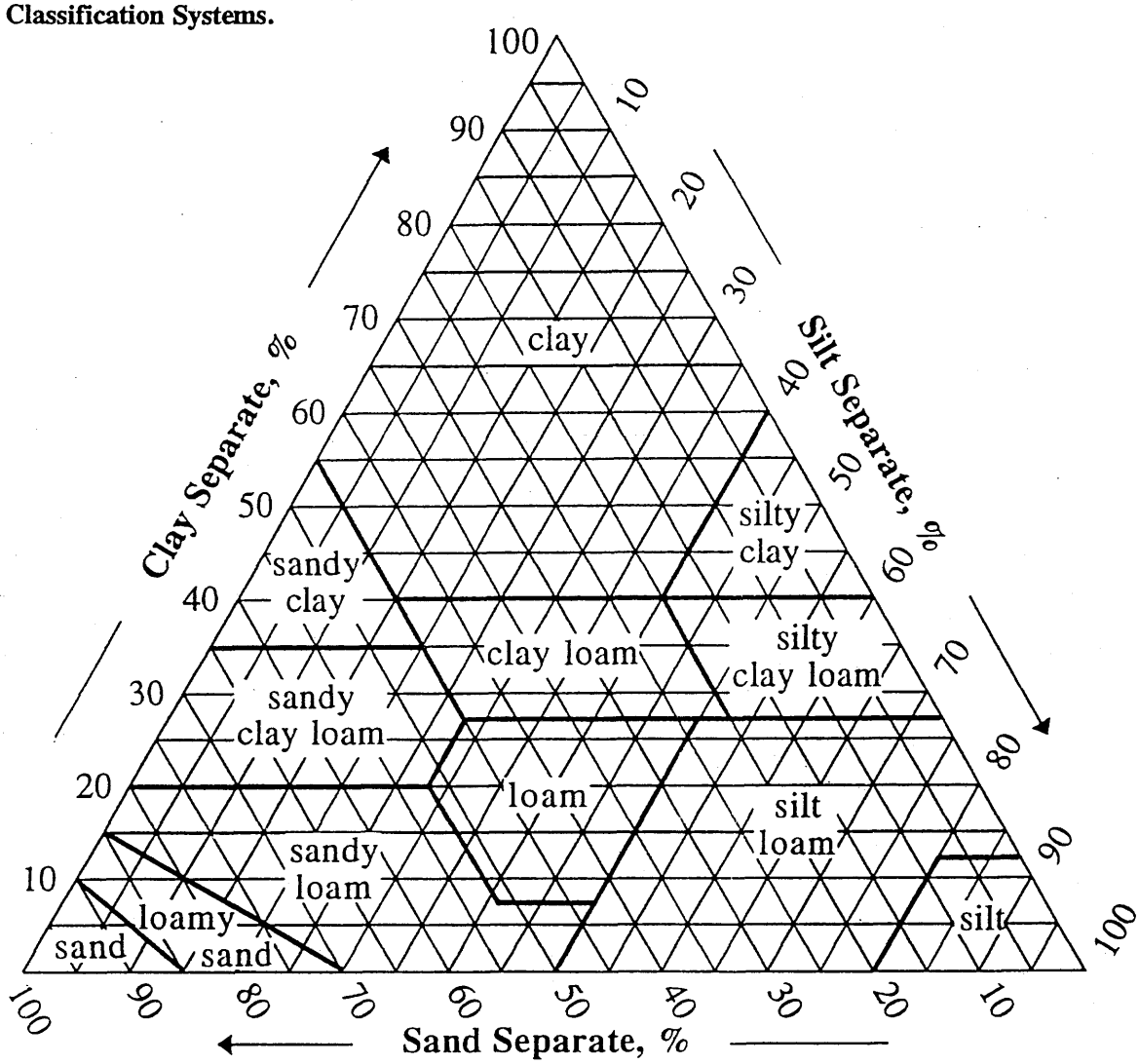
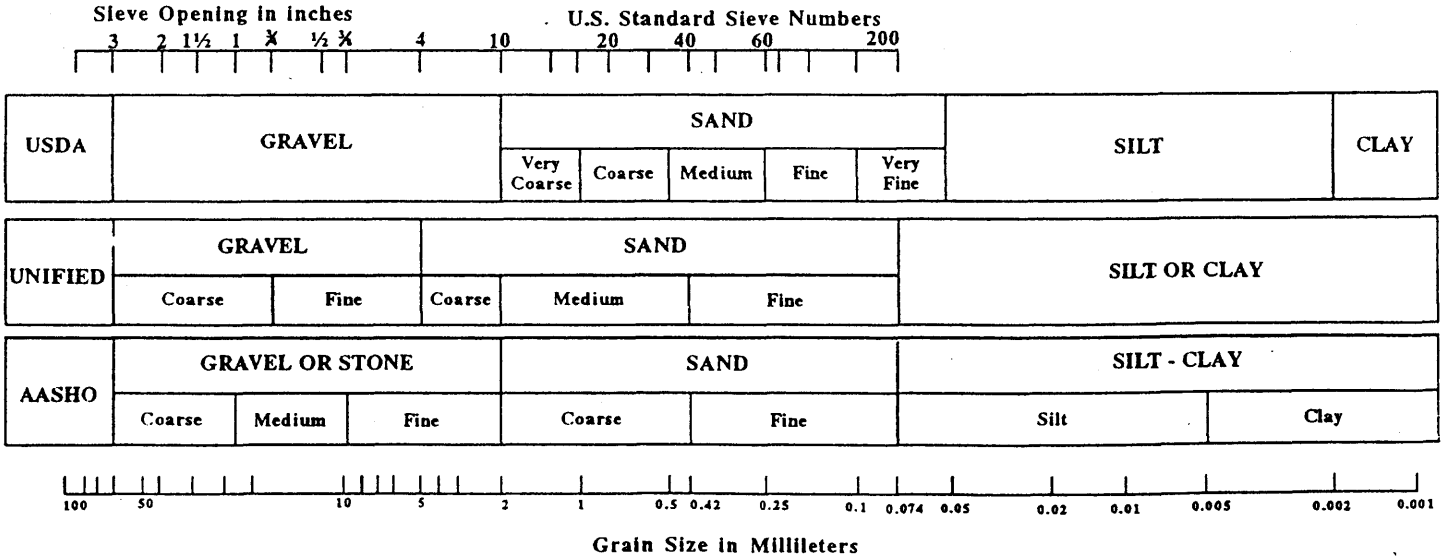


Exhibit 618-8 Texture Triangle and Particle-Size Limits of AASHTO, USDA, and Unified Classification Systems.



COMPARISON OF PARTICLE SIZE SCALES



APPENDIX D

Soil Profile Descriptions
Carbon Area Soil Survey Mapping Information

Field Soil Profile Description Notations

This is a guide to assist in understanding the notations on the soil description forms. These are not all inclusive but are meant to apply to common situations in the mountains and foothills of central Utah.

Horizon:

Standard letter designations used for soil layers. Commonly used designations are:

A	Surface layer usually of dark color due to accumulation of organic matter; topsoil.
B	Altered soil layer, often associated with subsoil.
	BT – Increase in clay
	BK – Increase in carbonates
	BW – Color or structure change
C	Relatively unaltered parent materials from which the soils have formed.
R	Hard bedrock; as sandstone
CR	Soft bedrock; as shale

A "B" horizon may have dark colors and have high to moderate amounts of organic matter but be designated as a "B" horizon due to soil changes as noted above.

Depth:

Depth interval of the soil layer. Usually expressed in inches unless noted otherwise.

Color:

Dry and moist colors are based on the Munsell Soil Color Chart and give the hue, value, and chroma. Connotative color descriptions may be added.

Texture:

Texture and texture modifier abbreviations

S	Sand	SCL	Sandy	CB	Cobbly	GR.	Gravely
LS	Loamy Sand	CL	Clay Loam	CBV	Very Cobbly	GRV	Very Gravely
SL	Sandy Loam	SICL	Silty Clay Loam	CBX	Extremely Cobbly	GRX	Extremely Gravel
L	Loam	SIC	Silty Clay	CN	Channery	SH	Shaley
SIL	Silt Loam	C	Clay	CNV	Very Channery		
SI	Silt			CNX	Extremely Channery		

Structure:

Grade		Size		Type	
W	Weak	VF	Very Fine	PL	Platy
M	Moderate	F	Fine	GR	Granular
S	Strong	M	Medium	SBK	Subangular Blocky
		CO	Coarse	ABK	Angular Blocky
		VCO	Very Course	PR	Prismatic
				W	Weak Massive
				S	Strong Massive
				SG	Single Grained

Consistency:

Dry		Moist		Wet	
LO	Loose	LO	Loose	NS	Non Sticky
SO	Soft	VFR	Very Friable	SS	Slightly Sticky
SH	Slightly Hard	FR	Friable	S	Sticky
H	Hard	FI	Firm	VS	Very Sticky
VH	Very Hard	VFI	Very Firm	NP	Non Plastic
EH	Extremely Hard	EFI	Extremely Firm	SP	Slightly Plastic
				P	Plastic
				VP	Very Plastic

Reaction:

Effervescence (10% HCL)		pH	Reaction Class
		5.1 – 5.5	Strongly Acid
		5.6 – 6.0	Moderately Acid
EO	Non-Effervescent	6.1 – 6.5	Slightly Acid
SE	Slightly Effervescent	6.6 – 7.3	Neutral
EM	Moderately Effervescent	7.4 – 7.8	Mildly Alkaline
ES	Strongly Effervescent	7.9 – 8.4	Moderately Alkaline
EV	Violently Effervescent	8.5 – 9.0	Strongly Alkaline
		> 9.0	Very Strongly Alkaline

Horizon Boundaries:

Distinctness

A Abrupt (<2 cm thick)
C Clear (2 to 5 cm thick)
G Gradual (5 to 15 cm thick)
D Diffuse (>15 cm thick)

Topography

S Smooth (the boundary is a plane with few or no irregularities)
W Wavy (the boundary has undulations in which depressions are wider than they are deep).
I Irregular (the boundary has pockets that are deeper than they are wide)
B Broken (at least one of the horizons or layers separated by the boundary is discontinuous and the boundary is interrupted).

Rock Fragments: Expressed in percent by volume by size.

GR	Gravel	BL	Boulders
CB	Cobbles	CN	Channers
ST	Stones	FL	Flagstone

Roots: Roots are described in terms of quantity and size. Quantity is given first followed by the size class.

Quantity		Size	
F	Few	VF	Very Fine
C	Common	F	Fine
M	Many	M	Medium
		CO	Course

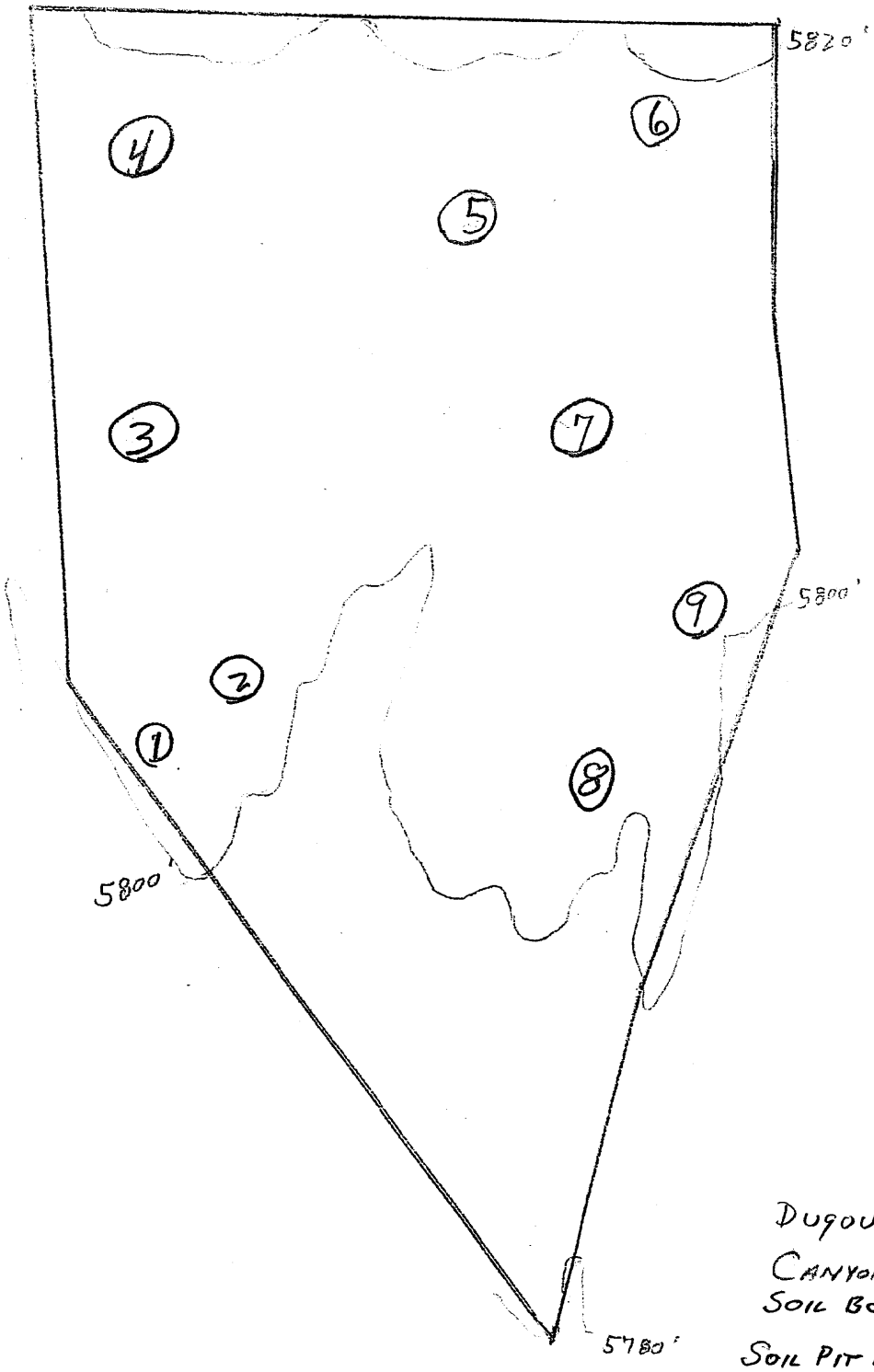
Quantity classes of roots are defined in terms of numbers of each size per unit area. One (1) square centimeter for very fine and fine roots and one (1) square decimeter for medium and coarse roots.

Few:	Less than 1 per unit area of the specified size
Common:	1 to 5 per unit area of the specified size
Many:	more than 5 per unit area of the specified size

The size classes are:

Very Fine:	Less than 1 mm in diameter
Fine:	1 to 2 mm in diameter
Medium:	2 to 5 mm in diameter
Coarse:	5 mm or larger in diameter

Roots larger than 10 mm in diameter may be described separately.



Dugout Canyon Mine
Canyon Fuel Co.
Soil Borrow Site
Soil Pit Locations

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION Dugout Soil Borrow

Soil type Razola Carbon Area M.U. 91

File No. SB1

Area Dugout Mine Soil Borrow Site Carbon Co., UT | Date 10/5/05 | By: D. Larsen | Stop No.

Classification Fine-silty, mixed, active, calcareous, mesic Typic Torrifluvent

Location SB1, SE corner S17, T14S, R12E

N. veg. (or crop) Sagebrush, Indian rice grass, salt bush | Climate Aridic Mesic

Parent material Alluvium

Physiography Alluvial fan, bottom (Clark Valley)

Relief Gently | Drainage Well drained | Salt or alkali

Elevation about 5800 feet | Gr. water | Stoniness

Slope 1% | Moisture Mostly dry

Aspect South | Root distrib. | % Clay *

Erosion Gullied | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes

Sterling Miller Backhoe operator (Scamp Excavation)

12-36" many cicada casts (holes)

Samples SB1 0-5
5-13
13-32
32-54
54-78

Some columnar structure in B-horizon

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Lab pH	Boundary	% Rock Fragments	Root Distribution	Carbonates
A1	0-5	pale brown 2.5Y 6/3 to	2.5Y 4/3-5/3 light olive brown	* Loam	MFGR	SO	FR	S/P	es 7.6	CW	<5% few small	many fine	-
AB	5-10	10YR 6/3 light yellowish brown	2.5Y 5/3	Loam	WM SBK	SH	FR-FI	S/P	es 7.8	CW	gravel	Common fine + med.	-
BK1	10-13			Loam	MM SBK	H	FI	S/P	es 7.8	gw	"	"	few light patches
BK2	13-32	No obs. except for light spots		Loam		H	VFI	S/P	ev 7.9	gw	"	Common to few fine-med	common light patches
BK3	32-54	Appears to be highest in carbonates (36-48)	2.5YR 5/3 to 10YR 4/4	Loam-SICL	SM SBK	VH	VFI	S/P	ev 7.6	gw	"	very few	Abundant white patches
BK4	54-72			Loam	MM SBK			S/P	ev 7.7	CW	"	"	common
BC	72-80	Light yellowish br. 10YR 6/4	10YR 5/4-2.5Y 5/3	Loam	OM				es			0	not observed

* Loam texture is similar to silt loam

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Ravola | File No. SB2

Area Dugout Mine Soil Borrow Carbon Co. UT | Date 10/5/05 | By: D. Larsen | Stop No.

Classification

Location SB2 SE center S17, T14S, R12E

N. veg. (or crop) Sagebrush (black?), snakeweed, Indian ricegrass | Climate Aridic Mesic

Parent material Alluvium

Physiography Fan, Alluvial

Relief Gentle | Drainage well drained | Salt or alkali

Elevation About 5810 feet | Gr. water | Stoniness

Slope 3-5% | Moisture

Aspect South | Root distrib. | % Clay *

Erosion Severe in area Slight at pit site | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Med.

Additional notes Backhoe pit SB2

Sampled 0-8
8-15
15-26
26-48
48-70

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution	whitish Carbonates + channels	
A1	0-3	10YR 6/3-4/3	2.5Y 4/3-5/3 Slightly Toward 10YR	LOAM	WFPL-WFGR	SO	VFR	SS/SP	es 7.7	CS	5gr	Many fine-v.f. m		
A2	3-8	2.5Y 6/3	"	LOAM	WF-M GR	SO	FR	SS/SP	7.7	CW	10% gr in spots	"		
AB	8-15	"	"	LOAM	WFGR WFSBK	SH	FR-FI	SS/SP	7.7	CW	2-15 gr	Common f-m		
BK1	15-26	2.5Y 6/3	2.5Y 4/3	LOAM	WMSBK-om	SH-H	FI	S/P	7.8	gw	<2	Few-common f-m	Few	
BK2	26-48	2.5Y 5/3 to 6/3 mixed 2.5Y 8/1 patches (white)	2.5Y 4/2	SILTY CLAY LOAM	MMSBK	H	FI	S/P	7.7	CW	<2	Few	Many Carbonate concretions	
BK3	48-76	"	"	SILT LOAM	MM SBK	H	VFI	S/P	7.7				Abundant	

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type

File No. 563

Area Dugout Mine Soil Borrow Site Carbon Co, UT | Date 10/5/05 | By: D Larsen | Stop No. 3

Classification

Location SB3 west side S17, T14S, R12E

N. veg. (or crop) Saltbush, Indian ricegrass, prickly pear, sage, etc | Climate Arid to Mesic

Parent material Alluvium from sandstone and shale

Physiography Alluvial fan, valley (Clarks Valley)

Relief Gentle | Drainage Well drained | Salt or alkali

Elevation About 5815' | Gr. water | Stoniness

Slope 3-5% | Moisture Dry throughout

Aspect South | Root distrib. | % Clay *

Erosion Moderate. | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes

Samples: 0-6
SB3 6-18
18-38
38-45 gravelly
45-72

Less carbonate patches than in SB1 and SB2

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Lab pH	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A	0-6	2.5Y 6/3	2.5Y 4/3	LOAM	wFPL upw 3" WFGR	SO	FR	SS/SP	es 7.8	CW	<5% gr	Common fine-v. fine		
BK1	6-18	"	2.5Y 5/3	LOAM	MMSBK OM	SH-H	FI	S/P	es 7.9	gw	"		Common pale spot *	
BK2	18-38	2.5Y 6/3	2.5Y 5/3-5/4	LOAM	"	VH	VFI	S/P	es 8.2	CS	"		common 2.5Y 7/2	
BK3	38-45	gravelly	layer	SANDY LOAM	0 SG	L	FR	SO/PO	es 7.8	CS	60% Gr	Few F	Des.	
BK4	45-74	2.5Y 5/3-6/3	2.5Y 4/3	LOAM	MMSBK OM	H	VFI	S/P	es 7.6		<5% gr		Few Mostly without light spots	

*Not as white as some peds

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type

File No. SB4

Area Dugout Canyon Mine Soil Borrow Site | Date 6/5/05 | By: D. Larsen | Stop No.

Classification

Location NW Corner of The Site

N. veg. (or crop) Saltbush, Indian rice grass, prickly pear, sage | Climate Aridic Mesic

Parent material Alluvium from sandstone and shale

Physiography Alluvial fan, valley

Relief Gently sloping | Drainage Well drained | Salt or alkali

Elevation 5815' | Gr. water | Stoniness

Slope 3-5% | Moisture Dry

Aspect South | Root distrib. To about 50" No restrictions | % Clay *

Erosion Moderate, surface | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes Many cicada casts; mostly at 20 to 30 inches

Samples SB4 0-5
5-18
18-31
31-44
44-64

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Lab.	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A	0-5	2.5Y 6/3	2.5Y 5/3 - 4/3	* LOAM	WF platy + WFGR	SO	FR	SS/SP	es 7.8	CS	<5 Gr	many vf-m		
AB	5-18			LOAM	MM SBK	SH-H	FI	S/P	8.2	gw	5 Gr spot up to 20%	common f-m		
BK	18-31			LOAM	MM SBK	VH	VFI	S/P	8.4	CW	<5 Gr	few fine	Few light patches + carbonates on gravel	
BKC1	31-44			Gr-SANDY LOAM	SG-OM	SH	FR	SO/PO	7.9	CW	50 GR <3/4"	very few		
BKC2	44-64			LOAM	WM SBK-OM	VH	VFI	S/P	7.7	gw	<5 Gr	last CT 50"	Few	
C	64-76	2.5Y 5/3 - 6/3	2.5Y 4/3	LOAM	(massive) OM	H	VFI	S/P			<5 GR			

* Field Texture is more like silt loam

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type NRCS M.V. 91 Ravola

File No. SB5

Area Dugout Canyon Mine Soil Borrow Site Carbon Co. UT | Date 10/5/05 | By: D. Larsen | Stop No.

Classification

Location North central portion of site — S17, T14S, R12E

N. veg. (or crop) Shadescale, Indian ricegrass et — Climate

Parent material Alluvium from sandstone and shale

Physiography Alluvial Fan; valley

Relief Gentle — Drainage well drained — Salt or alkali

Elevation ≈ 5815 FT — Gr. water — Stoniness

Slope 3-5% — Moisture

Aspect South — Root distrib. — % Clay *

Erosion Moderate — % Coarse fragments * — % Coarser than V.F.S. *

Permeability Moderate

Additional notes

Samples: SB5 0-12" (mixed A-horizons)
12-30"
30-56"
56-68"

@ 5:50PM - Low light for colors

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	10% HCl Reaction Lab pH	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A1	0-3	2.5Y 6/3	2.5Y 5/3	LOAM	WFGR-WFPL	SO	FR	S/P	es 7.9	CW	5GR	MANY VF-F		
A2	3-8	10YR 6/2	10YR 5/2-4/2	LOAM	MMPL → MMSBK	SH	FI	S/P	es 7.9	CW	5GR	Common VF-M		
A3	8-12	fine gravel and sandy layer 10YR 5/2	10YR 4/2	SANDY LOAM	WFGR-OSGR	SO-LO	FR	SS/SP	es 7.9	CW	40GR fine	Common VF-M		
BK1	12-30	10YR 6/2	10YR 4/3-5/3	LOAM	MM SBK	H	VFI	S/P	es 8.3	GW	25 GR	Common F	1/4 1-1/2" Common Patches	
BK2	30-56	10YR 6/2 spots of 2.5Y 8/1	10YR 4/3	LOAM	SMSBK	VH	VFI	S/P	es 7.8	GW	"	V. Few F	Many at 30-54"	
BK3	56-68	less carbonates and more tan hard		LOAM	WMSBK TO OM			S/P	es 7.9	GW	"	"		
BC	68-78	10YR 5/4-6/4	10YR 4/4	LOAM	OM (Massive)	H	FI	S/P	es 7.8		"			

SCS-SOILS-232G

Canyon Fuel Co.

SOIL DESCRIPTION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Soil type Carbon Co., UT

File No. SB6

Area Dugout Canyon Mine Soil Borrow Site | Date 10/6/05 | By: D. Larson | Stop No.

Classification

Location Northeast corner of site S17, T14S, R12E

N. veg. (or crop) Shadescale, Indian ricegrass, black sage | Climate Arid to Mesic

Parent material Alluvium from sandstone and shale

Physiography Alluvial fan, valley (Clark Valley)

Relief Gently sloping | Drainage | Salt or alkali

Elevation About 5820' | Gr. water | Stoniness

Slope 3-5% | Moisture

Aspect South | Root distrib. | % Clay *

Erosion Moderate | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes

Samples: SB6 0-8"
8-17
17-29
29-48
48-68

High proportion of very fine sand in the sand component

* Control section average

Horizon	Depth Inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution	Carbonates white	Pores
A1	0-4	2.5Y 5/2-6/3	2.5Y 4/3	LOAM	MFGR MFPL	SO	FR	SS/SP	es 8.0	CS	<5GR	Many Fine		
A2	4-8		10YR 5/2-4/3	LOAM	MMPL	SH	FI-FR	S/P	8.0	CW	"	Common F-m		
BK1	8-17		10YR 5/3-4/3	SANDY LOAM	WMSBK	H	FI	SS/SP	8.3	GW	"	Com. F-m	Few	Many pores
BK2	17-29		2.5Y 5/3 · 10YR 5/4	LOAM	M-S MSBK	VH	VFI	S/P	7.9	CW-GW	"	Few	Common	
BK3	29-48		10YR 4/4-5/4	LOAM	SMSBK	VH	VFI	S/P	7.9	GW	"		Many	
BKC	48-80		10YR 5/4	LOAM	WMSBK OM	H	FI	S/P	7.9		"		Few to Com.	

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Parola

File No. SB7

Area Dugout Canyon Mine Soil/Borrow Site Carbon Co, UT | Date 10/6/05 | By: D. Larsen | Stop No.

Classification

Location NE Center portion of site S17, R14S, T12E

N. veg. (or crop) Shadscale, Indian rice grass | Climate Arid to Mesic

Parent material Alluvium from sandstone and shale

Physiography Alluvial fan, valley (Clark Valley)

Relief Gentle slope | Drainage Well drained | Salt or alkali

Elevation ~ 5810 | Gr. water | Stoniness

Slope 3-5 | Moisture

Aspect South | Root distrib. | % Clay *

Erosion Moderate | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes

Samples: SB7 0-3"
3-8"
8-23
23-50
50-72

Fair for Topsoil to 23"

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Lab. pH	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A1	0-3	2.5Y 6/2 - 6/3	2.5Y 5/3 - 10YR 4/3	LOAM	WFGR	SO	FR	SS/SP	all es 7.9	CS	<5 GR	Common vf-f		
AB	3-8	2.5Y 6/3	2.5Y 4/3 - 10YR 4/3	LOAM	WMPL	SH	FR	S/P	8.0	CW	"	Common vf-m		
BK1	8-23	2.5Y 6/2 - 6/3	2.5Y 5/3 - 4/2	LOAM	OM	H	FI	S/P	8.2	CW	"	Few to common f-m	Few white patches	
BK2	23-56		10YR 4/4 - 2.5Y 4/3	(GRSL) SANDY LOAM	SG Banded	H	FI	SS/SP	8.0	CW	50 GR <2"	Few fine	Common	
BK3	50-72		2.5Y 4/2 - 4/3	LOAM	OM → MMSBK	H	VFI	S/P	7.8	CW	5 GR	V.F.	Common	
BC	72-78		2.5Y 4/3	(GRL) LOAM	OM	H	FI	SS/SP S/P	7.8		40 GR		Few	

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type

File No. SB8

Area Dugout Canyon Mine Soil Borrow Site, Carbon Co., UT | Date 10/6/05 | By: D. Larson | Stop No.

Classification

Location East side S17, T14S, R12E

N. veg. (or crop) Shadscale Indian rice grass, etc. | Climate Arid to Mesic

Parent material Alluvium from sandstone and shale

Physiography. Alluvial fan valley

Relief Gentle slope | Drainage Well drained | Salt or alkali

Elevation 5800 feet | Gr. water | Stoniness

Slope About 3% | Moisture

Aspect South | Root distrib. | % Clay* ≈ 24%

Erosion Moderate - gullies near | % Coarse fragments* mostly < 5% | % Coarser than V.F.S.*

Permeability Moderate 8" layer of v. gravelly soil

Additional notes

Samples: SB8 0-8"
8-16"
16-39"
39-47 (gravelly)
47-72

* Control section average

Horizon	Depth Inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Lab. pH (e 10% HCl)	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A1	0-4	2.5Y 6/2	2.5Y 5/3	20% c LOAM	WFGA + WFPL	SO	FR	S/P	es 7.8	CW	<5GR	common to many VF-M		
A2	4-8	2.5Y 6/3	2.5Y 5/3	LOAM	MMPL	SH	SFI		7.8	CW	"	"		
AB	8-16	"	"	LOAM	WMSBK	H	FI		8.0	GW	"	Common F-M	Few faint patches	
BK1	16-28	"	"	24% c LOAM	MMSBK	VH	VFI		7.8	GW	"	Few	Few to common	
BK2	28-39		2.5Y 4/3 - 5/3	LOAM	MMSBK	VH	VFI		7.8	AS	"		Common patches & streaks	
BK3	39-47	gravelly layer		VGR SANDY LOAM	OM-SGR	SH-L	FR-FI	SS/SP	7.7	AD Disc.	50GR	V. Few	"	
BK4-Bt	47-73		2.5Y 4/3 - 5/3	26% c LOAM *	MCABK	VH	VFI		7.6		5GR		Common distinct secondary patches	
C	73-83		Slightly browner 10YR 4/4	LOAM	OM → WMSBK	H	FR				<5GR			

SCS-SOILS-232G

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type

File No. 589

Area Dugout Canyon Mine Soil/Borrow Site Carbon Co., UT | Date 10/6/05 | By: D. Larson | Stop No.

Classification

Location East edge near center of site S17, T14S, A12E

N. veg. (or crop) Shadescale, Indian ricegrass, blacksage | Climate Aridic Mesic

Parent material Alluvium from sandstone and shale

Physiography Alluvial fan, valley (Clark Valley - NW corner)

Relief Gentle | Drainage Well drained | Salt or alkali

Elevation About 5800 ft. | Gr. water | Stoniness

Slope 3% - 5% | Moisture Mostly dry - slightly moist at 36-50"

Aspect South | Root distrib. Mostly upper 36" High carb. | % Clay *

Erosion Moderate (gullies nearby) | % Coarse fragments * | % Coarser than V.F.S. *

Permeability Moderate

Additional notes

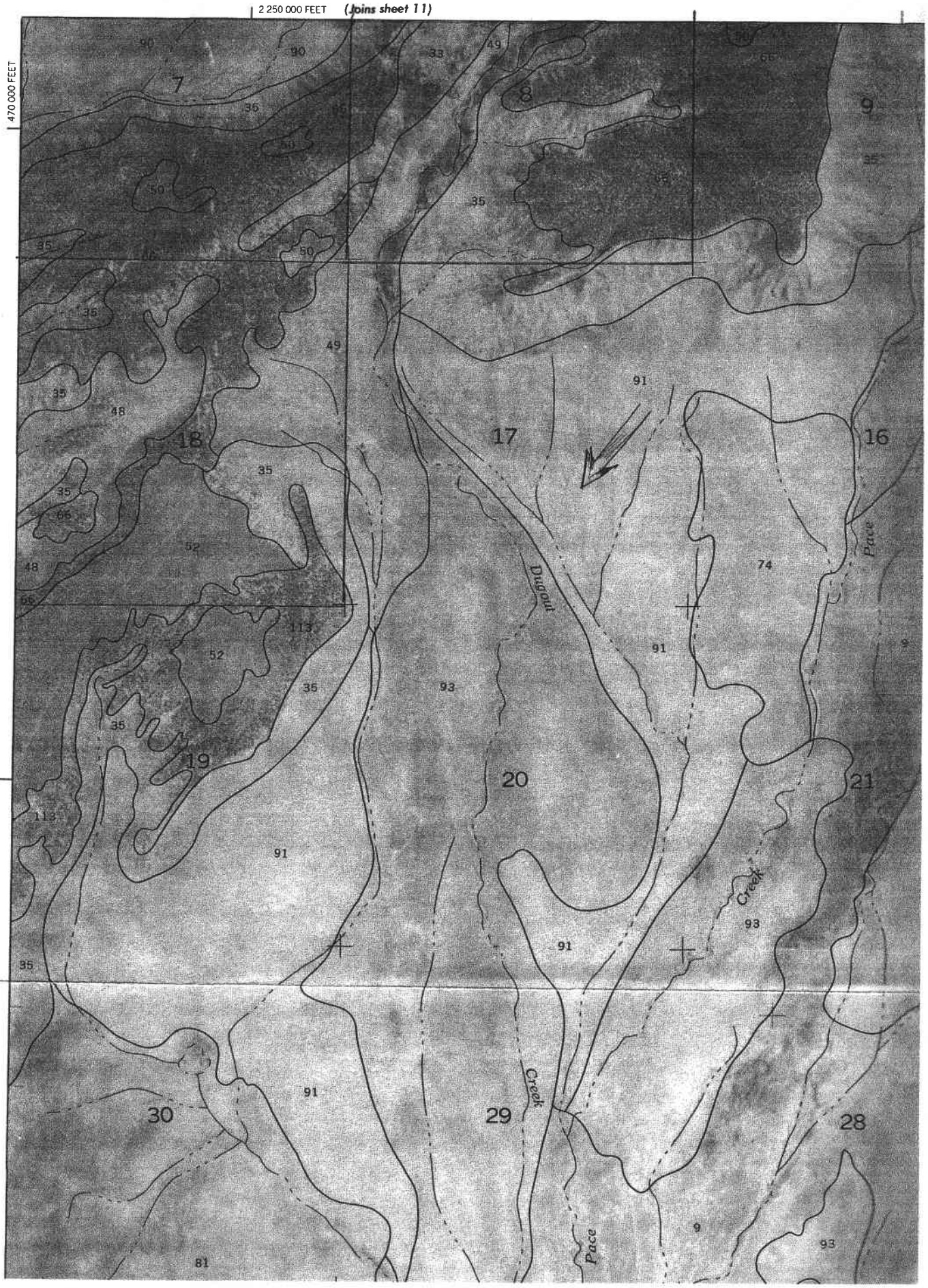
Samples: SB9 0-7"
7-20"
20-36"
36-84"

Many cicada casts at 15 to 30"

* Control section average

Horizon	Depth (inches)	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution	Carbonates	
A	0-7	2.5Y 5/2	2.5Y 4/2	26%c LOAM	WFGR + WMPL	SO-SH	FR	S/P	es 7.9	CS	<5% GR	Common To Many VF-M		
AB	7-20	2.5Y 6/3 - 10YR 6/2	10YR 4/4 - 2.5Y 4/2	LOAM	MF-M SBK	H	FI	S/P	8.3	GS	"	Common F-M		
BK1	20-36	2.5Y 6/3	2.5Y 4/2	LOAM	MMSBK	VH	FI	S/P	8.3	GW	"	Few Fine	Few Faint patches	
BK2	36-84	10YR 6/3	2.5Y 4/2 - 10YR 5/3	21%c LOAM	MMSBK - OM	VH	FI	S/P	8.3		"	V. Few	Abundant prominant white patches and streaks	

60-70% si + vfs



Carbon Area Soil Survey

Topsoil Borrow Area

The potential plant community on the Ravola soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Among the important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, a planned grazing system, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. For critical erosion control, small areas can be mechanically treated and seeded. Native plants are suitable for critical area seedings.

If areas of this unit are irrigated, suitable management practices used to maintain or improve the area include conservation cropping systems with rotations of alfalfa hay, small grain, and corn. To maintain production, crop residue should be incorporated into the soil and fertilizer should be applied.

Irrigation water can be applied by the sprinkler or flood method. Fields can be leveled.

This map unit is in capability unit IIe-2, irrigated, and in capability subclass VIIe, nonirrigated. It is in the Desert Loam range site.

91—Ravola loam, 1 to 6 percent slopes, eroded. This very deep, well drained soil is on alluvial fans and narrow valley floors. It extends from Helper to Wellington and south to the Carbon-Emery county line. It formed in alluvium derived dominantly from sandstone and shale. Slopes are dominantly 3 to 6 percent, 100 to 300 feet long, and concave to convex. The vegetation in areas not cultivated is mainly galleta, shadscale, and some greasewood. Elevation is 5,300 to 6,000 feet. The average annual precipitation is 6 to 8 inches, the average annual air temperature is 48 to 50 degrees F, and the average freeze-free period is 115 to 140 days.

Typically, the surface layer is light brownish gray loam about 2 inches thick. The next layer is light brownish gray loam about 21 inches thick. Below this to a depth of 60 inches or more is light brownish gray silt loam.

Included in this unit are about 5 percent Billings silty clay loam, 5 percent Killpack clay loam, and small areas of Persayo loam. Also included are small areas of Ravola loam, 1 to 3 percent slopes.

Permeability of this Ravola soil is moderate. Available water capacity is about 7.5 to 10.5 inches. The water supplying capacity is 4 to 5 inches in areas not irrigated. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. Runoff from adjacent areas has formed gullies in some areas of this soil. The gullies are *V*-shaped, are 4 to 8 feet deep, and in some areas are 100 to 400 feet apart. The hazard of soil blowing is moderate.

This unit is used mainly as rangeland and wildlife habitat. It is also used for irrigated crops and for homesite and urban development.

The potential plant community on the Ravola soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Among the important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, a planned grazing system, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for critical area seedings are adapted native plants.

If areas of this unit are irrigated, suitable management practices include conservation cropping systems with rotations of hay or pasture and small grain. Crop residue should be kept on the surface of the soil. Pasture management that incorporates use of a rotation grazing system is best.

Sprinkler irrigation systems provide the best erosion control and the ability to apply irrigation water evenly to the fields. Flood irrigation can also be used if erosion is controlled.

This map unit is in capability unit IIIe-2, irrigated, and in capability subclass VIIe, nonirrigated. It is in the Desert Loam range site.

92—Ravola-Gullied land complex. This map unit is on alluvial fans and dissected narrow valley floors. It is widely distributed throughout the survey area. Some of the larger areas are along Drunkards Wash, Coal Creek, Miller Creek, Gordon Creek, and Soldier Creek. Slopes are 1 to 6 percent. Elevation is 5,300 to 6,000 feet. The average annual precipitation is 6 to 8 inches, the average annual air temperature is 48 to 50 degrees F, and the average freeze-free period is 115 to 140 days.

This unit is 70 percent Ravola loam, 1 to 6 percent slopes, eroded; 20 percent Gullied land; and 10 percent other soils. The Ravola soil is generally on valley floors, and the Gullied land is adjacent to the washes on the bottom of valleys. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Green River silt loam on the bottom of washes. Also included are small areas of Killpack clay loam near the adjacent shale hills.

The Ravola soil is very deep and well drained. It formed in alluvium derived dominantly from shale and sandstone. Slopes are 50 to 150 feet long and are concave to convex. The present vegetation in most areas is mainly shadscale, halogeton, winterfat, yellow

LOCATION RAVOLA UT+NM CO

Established Series
Rev. RLM/DKR/SSP/WWJ
03/2005

RAVOLA SERIES

The Ravola series consists of very deep, well drained soils that formed in alluvium derived from shale, siltstone, and sandstone. Ravola soils are on alluvial fans and flood plains. Slopes range from 0 to 10 percent. Mean annual precipitation is about 7 inches and the mean annual temperature is about 50 degrees F.

TAXONOMIC CLASS: Fine-silty, mixed, active, calcareous, mesic Typic Torrifluvents

TYPICAL PEDON: Ravola loam under cultivation. (Colors are for dry soil unless otherwise noted.)

Ap1--0 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable, slightly plastic; many fine roots, few coarse roots; common fine and medium pores; strongly effervescent; slightly alkaline (pH 7.8); clear smooth boundary. (2 to 6 inches thick)

Ap2--6 to 9 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; strongly compacted plowpan layer; weak coarse subangular blocky structure parting to weak coarse granular; hard, friable, slightly sticky and slightly plastic; many fine roots; common fine pores; few medium pores; strongly effervescent; slightly alkaline (pH 7.7); clear smooth boundary. (0 to 3 inches thick).

C1--9 to 18 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak very thin platy; hard, friable, slightly sticky and slightly plastic; few coarse and many fine roots; many medium and common fine pores, strongly effervescent; slightly alkaline (pH 7.7); gradual wavy boundary. (9 to 24 inches thick)

C2--18 to 45 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; few medium and many fine roots; common medium pores; strongly effervescent; moderately alkaline (pH 7.9); gradual irregular boundary. (6 to 30 inches thick)

C3--45 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; few fine roots; few fine pores; strongly effervescent; moderately alkaline (pH 7.9).

TYPE LOCATION: Emery County, Utah; about 1 1/2 miles south and 1/2 mile east of Huntington; located about 2,000 feet west and 600 feet north of the southeast corner of sec. 31, T. 17 S., R. 9 E.

RANGE IN CHARACTERISTICS:
Mean annual soil temperature: 49 to 56 degrees F
Particle-size control section: 18 to 27 percent clay and less than 15 percent sand coarser than very fine sand

A horizon:
Hue: 10YR to 5Y
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 2 or 4 dry or moist
Texture: loam, clay loam, very fine sandy loam, or silt loam
Calcium carbonate equivalent: 5 to 25 percent
Reaction: slightly to strongly alkaline

C horizon:
Hue: 10YR to 5Y
Value: 5 to 7 dry, 4 or 5 moist
Chroma: 2 to 4 dry or moist
Texture: stratified loamy sand to clay loam
Calcium carbonate equivalent: 5 to 25 percent
Reaction: slightly to strongly alkaline

COMPETING SERIES: This is the Billings series. Billings soils have particle-size control sections with 27 to 35 percent clay, and gypsum nodules below the series control section.

GEOGRAPHIC SETTING:
Parent material: alluvium derived from shale, siltstone, and sandstone
Landform: alluvial fans and flood plains
Slopes: 0 to 10 percent
Elevation: 4,500 to 6,000 feet
Mean annual temperature: 47 to 56 degrees F
Mean annual precipitation: 5 to 11 inches
Frost-free period: 110 to 160 days

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Billings soils and the Hunting, Killpack, Mayfield, Saltair, and Skumpah soils. Hunting soils have mottles and a water table at depths between 20 and 40 inches. Killpack soils have a paralithic contact between 20 and 40 inches. Mayfield soils have carbonatic mineralogy. Saltair soils contain calcic horizons. Skumpah soils have a natric horizon. are poorly drained

DRAINAGE AND PERMEABILITY: well drained, negligible to medium runoff, moderate or moderately slow permeability. These soils are subject to occasional brief flooding following high intensity summer thunderstorms.

USE AND VEGETATION: Irrigated areas are used for growing small grains, corn, sugar beets, alfalfa, and pasture. Potential vegetation is shadscale, greasewood, Indian ricegrass, and galleta.

DISTRIBUTION AND EXTENT: Eastern Utah, northwest New Mexico and western Colorado. LRR D, MLRA 28A, 34, 35, 37. This series is of large extent.

MLRA OFFICE RESPONSIBLE: Lakewood, Colorado

SERIES ESTABLISHED: Emery and Grand Counties, Utah. 1940. Green River Soil Conservation District.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: The zone from 0 to 9 inches. (Ap1 and Ap2)

Classified according to Soil Taxonomy Second Edition, 1999

ADDITIONAL DATA: Lab sampled by NSSL in New Mexico. Pedon number S86NM-045-014.

National Cooperative Soil Survey
U.S.A.

Hernandez Family

The Hernandez family consists of very deep, well drained, moderately permeable soils on fan terraces. These soils formed in alluvium derived from sandstone and shale. Slope is 1 to 8 percent. Elevation is 5,600 to 7,100 feet. Average annual precipitation is 10 to 14 inches, and average annual air temperature is 45 to 49 degrees F.

These soils are fine-loamy, mixed, superactive mesic ~~Ustollic~~ Ustic ~~Calciorthids~~. Haplocalcids.

Reference pedon of Hernandez family, 3 to 8 percent slopes, about 4.5 miles northwest of Sunnyside Junction, about 1,000 feet south and 800 feet east of the northwest corner of sec. 19, T. 14 S., R. 12 E.

A1—0 to 3 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, common fine, and few medium roots; many fine and few medium pores; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.2); abrupt smooth boundary.

B2—3 to 14 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common fine and few medium pores; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—14 to 39 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and plastic; few very fine and fine roots; common fine and few medium pores; strongly calcareous; thin coatings of calcium carbonate on faces of peds; strongly alkaline (pH 8.8); gradual wavy boundary.

C2ca—39 to 60 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; massive; hard, firm, slightly sticky and plastic; few very fine and fine roots; common fine and few medium pores; strongly calcareous; thin coatings of calcium carbonate on faces of peds; strongly alkaline (pH 9.0).

Secondary calcium carbonate is at a depth of 9 to 17 inches.

A horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry, and chroma is 2 to 4. Texture is loam or very fine sandy loam.

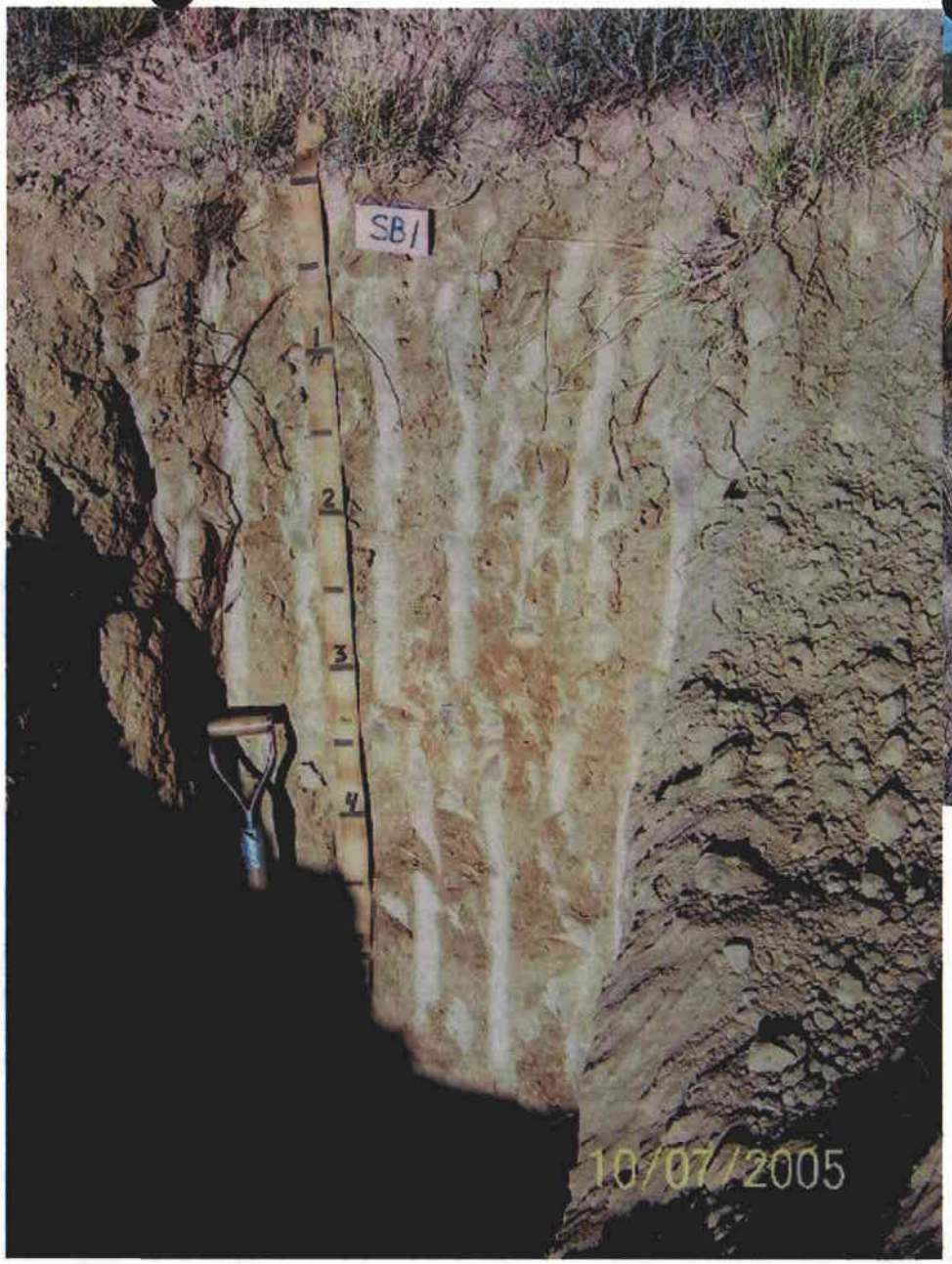
B horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry and 4 or 5 when moist, and chroma is 2 to 4.

Cca horizon: Hue is 7.5YR or 10YR, value is 6 to 8 when dry and 5 to 7 when moist, and chroma is 3 or 4. Calcium carbonate equivalent is 15 to 35 percent.

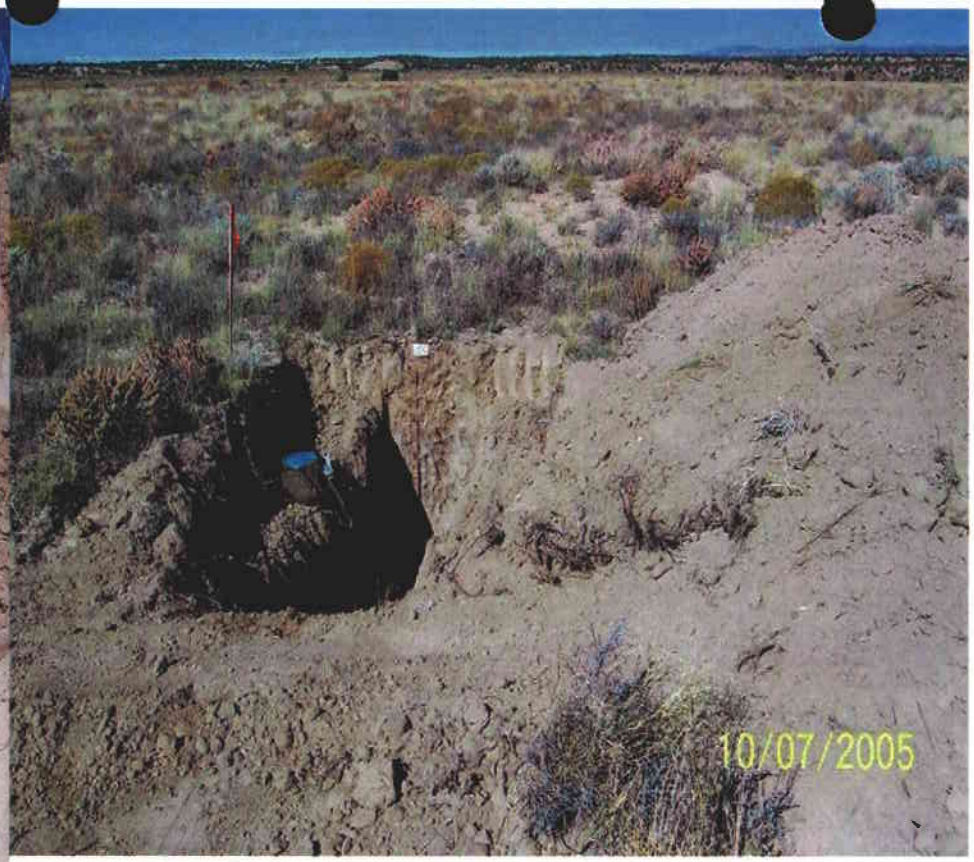
APPENDIX E

Photographs of Site and Soil Profiles
Soil Pit Locations

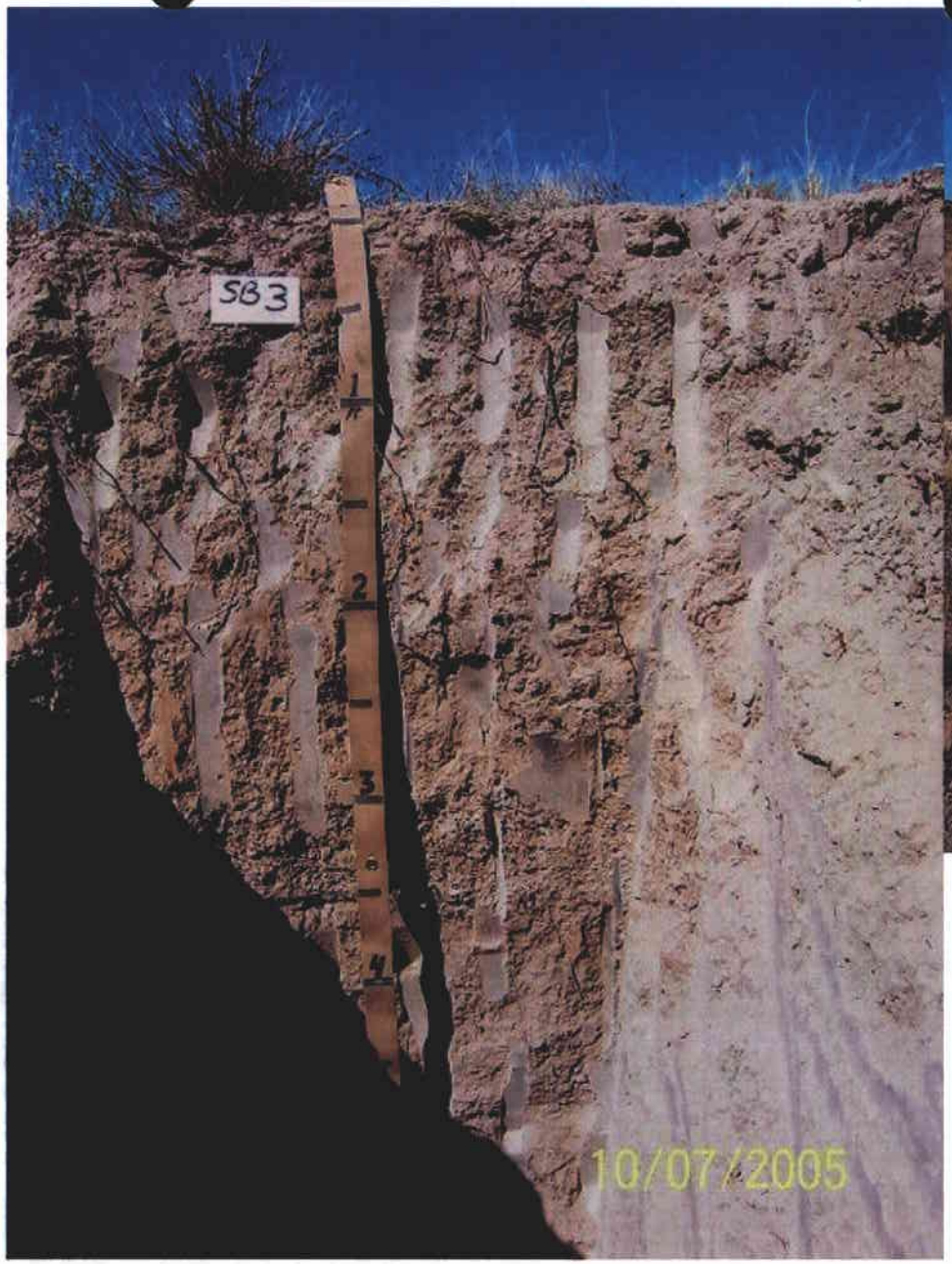
Refuse Pile soil borrow area, Dugout Canyon Mine, October 2005



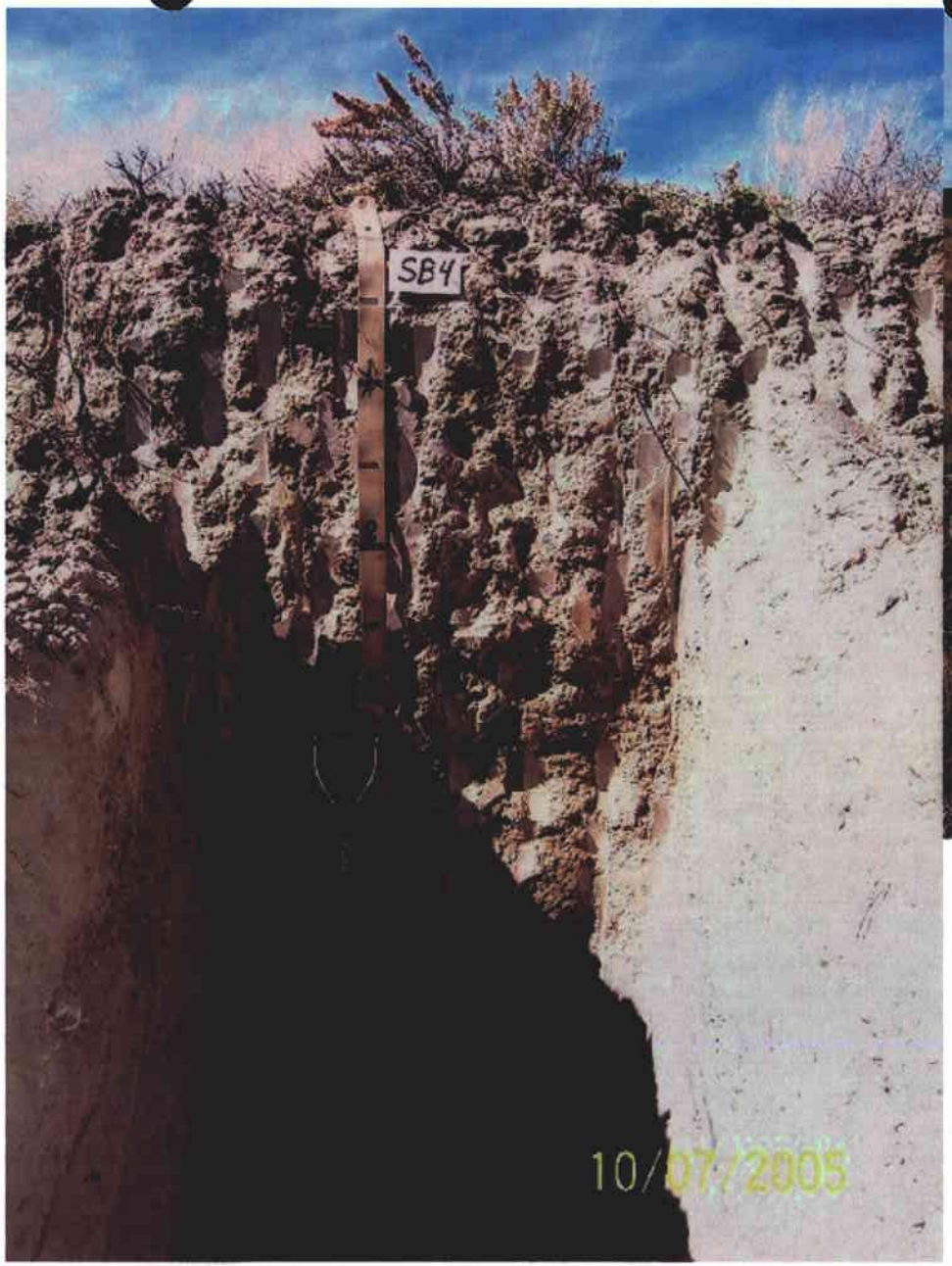
Soil Borrow Area – Sample Pit SB 1

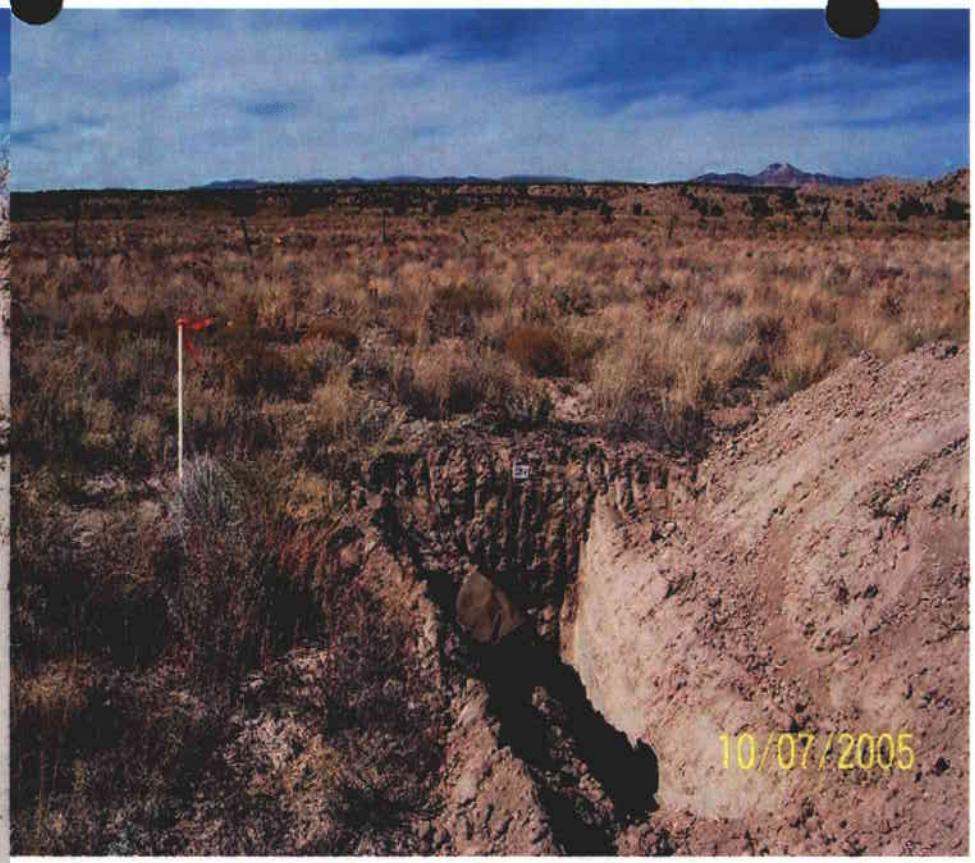


Soil Borrow Area – Sample Pit SB 2

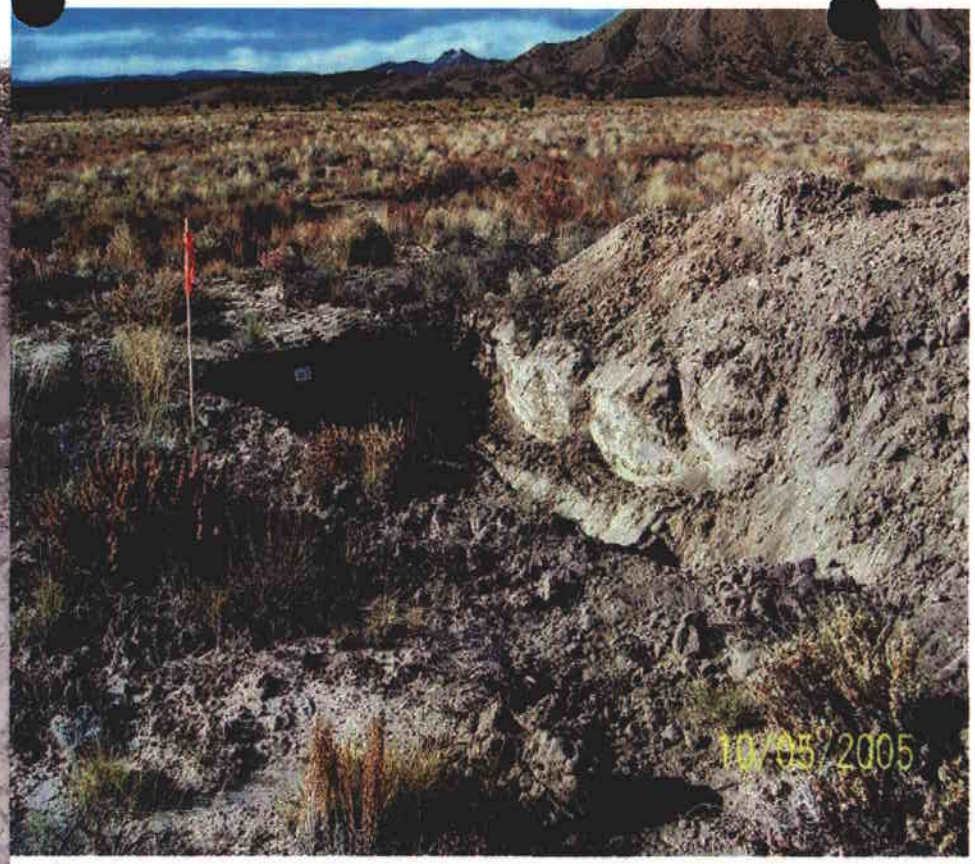


Soil Borrow Area – Sample Pit SB 3



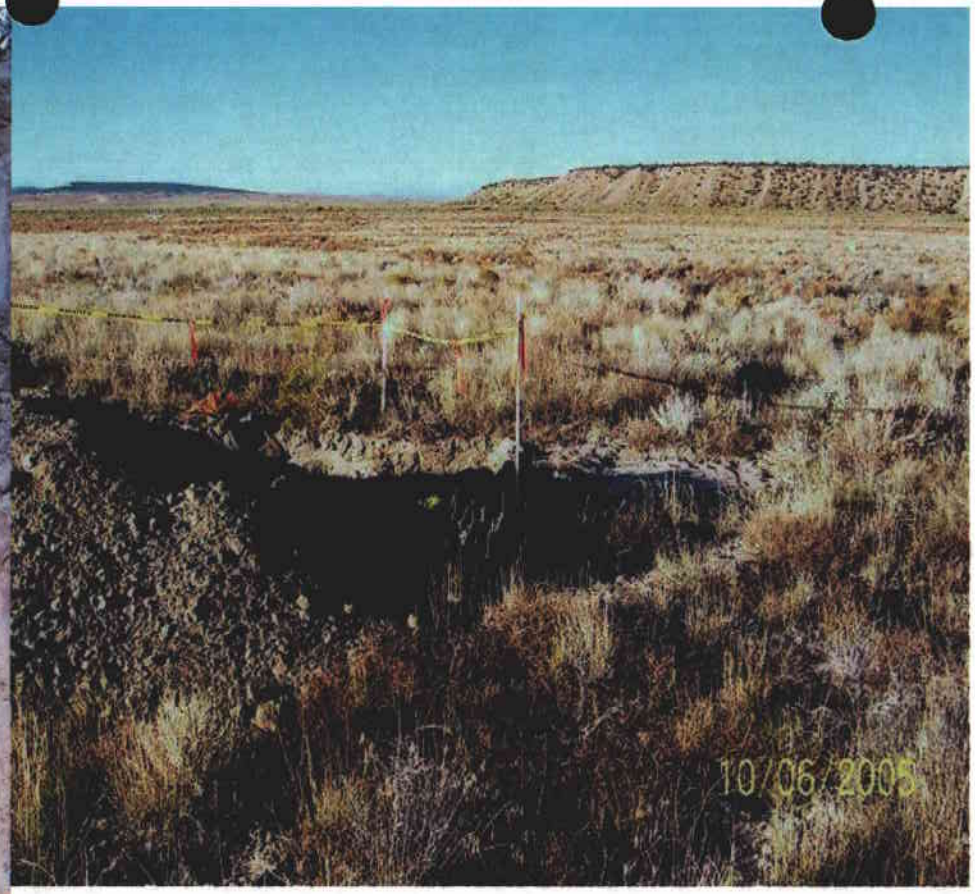


Soil Borrow Area – Sample Pit SB 4



Soil Borrow Area – Sample Pit SB 5

Soil Borrow Area – Sample Pit SB 6



Soil Borrow Area – Sample Pit SB 7

Soil Borrow Area – Sample Pit SB 8

Soil Borrow Area – Sample Pit SB 9