CANYON FUEL COMPANY, LLC

DUGOUT CANYON MINE

PACE CANYON FAN PORTAL FACILITIES

AMENDMENT

C/007/039

JANUARY 2005

Canyon Fuel Company, LLC
Soldier Canyon Mine
P.O. Box 1029
Wellington, Utah 84542
(435) 637-6360 Fax: (435) 637-0108

January 4, 2005

Ms. Pamela Grubaugh-Littig
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

RE: Pace Canyon Fan Portal Amendment, Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

Dear Ms. Grubaugh-Littig:

Attached please find four copies of an amendment to address the construction of a fan portal and associated structures in Pace Canyon. The binders with red dots on the inside of the front cover, contain colored pictures in the appendices, the others contain black and white copies of the pictures.

New plates associated with the Pace Canyon facilities have been placed in appendices in Chapters 5 and 7. The plate associated with Chapter 3, however, is to be placed with the other Chapter 3 plates. Plates 4-1 - Land Use and 7-1 Hydrologic Monitoring Locations have been revised for this submittal and will replace the currently approved plates in the M&RP. Calculations and studies associated with the Pace Canyon facilities have also been placed in their own appendices in Chapters 2, 3, 5 and 7. In Chapter 4, Appendix 4-3 the cultural information will need to be moved to the confidential folder, therefore a separate appendix was not created for the Pace Canyon facilities and cultural information for this submittal is located in Appendix 4-3.

The bond has been revised in Appendix 5-6 and in Chapter 8. We will await the Divisions's review and recommendations pertaining to the final bonding numbers.

Only redline copies have been submitted of the text, clean copies will be submitted upon approval of the amendment.

Dan Larsen has had an personal emergency and has prepared a partial report for the soils study done at the fan site, which is included, the final report will follow as soon as we receive a copy. I have e-mailed him concerning the importance of completing this report in a timely manner.

We appreciate your commitment to complete this review by the end of March 2005, please do not hesitate to contact us with concerns as they arise in your review process. We are committed to address your concerns as they arise.

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A copy of this submittal has been delivered to the Price field office.

Thank you for your assistance and if you have any questions, please call me at (435) 636-2869.

Sincerely yours,

Vicky S. Miller

Vicky S. Miller

cc: Dave Spillman
Pete Hess

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Canyon Fuel Company, LLC
Mine: Dugout Canyon Mine **Permit Number:** C/007/039
Title: Pace Canyon Fan Portal
Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

☒ Yes ☐ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: 2.7 ☒ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☒ Yes ☐ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☒ Yes ☐ No 15. Does the application require or include soil removal, storage or placement?
☒ Yes ☐ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☒ Yes ☐ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☒ Yes ☐ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☒ Yes ☐ No 21. Have reclamation costs for bonding been provided?
☒ Yes ☐ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☒ Yes ☐ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

David Spillman
Print Name

Daniel Spillman, Engineering Manager 12/30/04
Sign Name, Position, Date

Subscribed and sworn to before me this 30 day of December, 20 04

Vicky Sue Miller
Notary Public

My commission Expires: 1-5, 20 08

Attest: State of UTAH } } ss:
County of CARBON

VICKY SUE MILLER
NOTARY PUBLIC • STATE of UTAH
1776 KENILWORTH RD.
HELPER, UTAH 84526
COMM. EXPIRES 1-5-2008

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Form DOGM- C1 (Revised March 12, 2002)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Canyon Fuel Company, LLC
Mine: Dugout Canyon Mine **Permit Number:** C/007/039
Title: Pace Canyon Fan Portal

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Chapter 2, Text and Tables
☒ Add	☐ Replace	☐ Remove	Chapter 2, Appendix 2-1 add to the back of existing information
☒ Add	☐ Replace	☐ Remove	Chapter 2, Appendix 2-3 add to the back of existing information
☒ Add	☐ Replace	☐ Remove	Chapter 2, Appendix 2-9 - Pace Canyon Fan Facilities Topsoil and Storage Pile Calculations
☐ Add	☒ Replace	☐ Remove	Chapter 3, Text, Table and Figure
☒ Add	☐ Replace	☐ Remove	Chapter 3, Plate 3-1E - Pace Canyon Fan Vegetation and Reference Area
☒ Add	☐ Replace	☐ Remove	Chapter 3, Appendix 3-4 - Pace Canyon Fan Portal Vegetation and Wildlife Data
☐ Add	☒ Replace	☐ Remove	Chapter 4, Text
☐ Add	☒ Replace	☐ Remove	Chapter 4, Plate 4-1 - Land Use
☐ Add	☐ Replace	☒ Remove	Chapter 4, Appendix 4-3 - Cultural and Historical Studies
☒ Add	☐ Replace	☐ Remove	Chapter 4, Appendix 4-3 - Cultural and Historical Studies to CONFIDENTIAL FOLDER
☐ Add	☒ Replace	☐ Remove	Chapter 5, Pages 5-x, 5-xi, 5-1 thru 5-4, 5-10, 5-14 thru 5-17, 5-27, 5-28, 5-29, 5-36, 5-37, 5-41, 5-49 thru 5-53, 5-64, 5-66 thru 5-68, 5-70, 5-71, 5-75, 5-76, and 5-78
☐ Add	☒ Replace	☐ Remove	Chapter 5, Appendix 5-6, Bond Amount - Total Page, Pages 6 of 24, 44 and 45 of 95, 6 of 8, 7 of 8
☒ Add	☐ Replace	☐ Remove	Chapter 5, Appendix 5-6, Bond Amount - Pace Canyon Fan Portal Bond Calculations
☒ Add	☐ Replace	☐ Remove	Chapter 5, Appendix 5-10, Pace Canyon Fan Facilites, Plates PC5-2, PC 5-4, PC5-5
☐ Add	☒ Replace	☐ Remove	Chapter 7, Pages 7-ix, 7-1, 7-37, 7-43 thru 7-46, 7-49, 7-55, 7-56, 7-58, 7-61, 7-62, 7-65, 7-66, 7-72, 7-73, 7-76, 7-93 thru 7-95 and 7-97
☐ Add	☒ Replace	☐ Remove	Chapter 7, Plate 7-1
☒ Add	☐ Replace	☐ Remove	Chapter 7, Appendix 7-6 add to the back of existing information
☒ Add	☐ Replace	☐ Remove	Chapter 7, Appendix 7-7 add to the back of existing information
☒ Add	☐ Replace	☐ Remove	Chapter 7, Appendix 7-12 - Pace Canyon Fan Portal Site , Calculations, Plates PC7-4, PC7-5, PC7-5A, PC7-6 and PC7-7
☐ Add	☒ Replace	☐ Remove	Chapter 8, Page 8-1
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.

1/4/05
Clean copies of the text submitted currently in a redline version will be submitted upon approval of the amendment.

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CHAPTER 2

SOILS

210 INTRODUCTION

This chapter and associated appendices of this M&RP contain all pertinent information relating to identification, management, and reclamation activities associated with the soil resources present in the disturbed area of the Dugout Canyon Mine and the Pace Canyon Fan Portal Breakout. The information has been compiled from the previously approved soil sections for the Sage Point-Dugout Canyon Mine and Soldier Canyon Mine permits, ACT/007/009 and ACT/007/018, respectively, as well as new soil survey information gathered as part of this permit application. The soil studies were conducted in accordance with the Utah Division of Oil, Gas, and Mining guidelines that were in effect at the time each study was conducted. All previous surveys fulfilled the requirements established by the U.S. Soil Conservation Service (SCS). The site specific soil survey conducted for this permit application was conducted in accordance with the standards set by the National Cooperative Soil Survey and analyzed by horizon according to Table 1 of the Division's "Guidelines for the Management of Topsoil and Overburden for Underground and Surface Coal Mining" (Leatherwood, 1988).

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

A base map of the soils in the permit area has been created by compiling maps from the "Soil Survey of Carbon Area, Utah" prepared by the SCS (Jensen, 1988). The base map illustrates the locations and areal extent of the endemic soil resources within the permit area at an Order III level (Plate 2-1). In the disturbed area of the permit area, an Order I survey was conducted. The locations and areal extent of the endemic soil resources within the disturbed area identified during the Order I survey are illustrated on Plate 2-2.

This chapter provides a description of the pre-mining resources as specified under R645-301-221. Topsoil and subsoil to be saved under R645-301-232 will be removed and segregated from other material. After removal, topsoil will be immediately redistributed in accordance with R645-301-242, stockpiled pending redistribution under R645-301-234, or if demonstrated that an alternative procedure will provide equal or more protection for the topsoil, the Applicant will seek approval from the Division.

220 ENVIRONMENTAL DESCRIPTION

The Dugout Canyon Mine facilities are ~~is~~ located in the northern Book Cliffs - Roan Plateau region. More specifically, the mine is located within Dugout Canyon and Pace Canyon. The majority of the disturbed area is located in Dugout Canyon, with fan portal facilities located in Pace Canyon ~~on the northwest side of the canyon~~ (Plate 2-1 and PC5-2). The elevation of the disturbed area ranges between approximately 7000 and 7150 feet above MSL. Soils in the mine area are not cultivated due to their thin nature and relatively steep slopes on which they lie. These soils have formed in colluvium derived from sandstone and shale. Soils in the area are usually shallow and consist predominantly of stony to gravelly sandy loams with moderate permeability. The soils are highly susceptible to water erosion. Rock outcrops consist of alternating layers of sandstone and shale. Subordinate amounts of coal are also present.

The Pace Canyon Fan Portal Breakout is located in Pace Canyon (T13S. R13E, Section 30, N1/2NW14). The elevation of the disturbed area ranges between approximately 6950 and 7060 feet above MSL. Soils in the mine area are not cultivated due to their thin nature and relatively steep slopes on which they lie. These soils have been previously disturbed by various activities in the canyon, such as road construction, exploration, mining, logging, etc. The fan area encompasses steep rocky canyon walls with unconsolidated sediment benches.

221 Prime Farmland Investigation

As part of the application for the Sage Point-Dugout Canyon Mine permit, ACT/007/009, a reconnaissance of the disturbed areas was conducted in 1980 to determine if prime farmland was present, and if present, whether it would be impacted by mining activities. The reconnaissance included the presently-proposed disturbed area within the Dugout Canyon Mine permit area. Copies of the applicable pages from the prime farmland investigation for the Sage Point-Dugout Canyon Mine permit and correspondence with the Soil Conservation Service have been included as Appendix 2-1. One area within the previous area of investigation was determined to potentially be prime farmland. However, this area was located near the mouth of Soldier Creek Canyon, outside of the presently proposed permit area. No prime farmland was found in Dugout Canyon or anywhere else within the presently-proposed permit area during the previous investigation.

As part of this permit application, a survey of the disturbed area of the Dugout Canyon Mine was conducted to determine whether the soils could be considered as prime farmland. The Dugout Canyon Mine disturbed area lies within the Rock outcrop-Rubbleland-Travessilla complex and Croydon loam soils area (Plates 2-1 and 2-2). Neither of these soils are considered suitable prime farmland as described by the SCS (Jensen, 1988). No evidence of past cultivation of the soils in the disturbed area was found during the site investigation. Hence, based on the results of both detailed investigations conducted within the area, it is concluded that no prime farmland exists within the proposed permit area.

The survey for prime farmland investigation for the fan portal site was completed by Leland Sasser of the NRCS. The area planned for disturbance is not considered prime farmland. Refer to Appendix 2-1 for a copy of Mr. Sasser's letter.

222 Soil Survey

Soil survey information for those portions of the permit area to be affected by surface operations at the Dugout Canyon Mine is presented in Sections 222.100 through 222.300.

222.100 Soils Map

A map delineating the areal extent of the endemic soils resources within the permit area at an Order III survey level is presented on Plate 2-1. A description of these soils has been reproduced from the SCS "Soil Survey of the Carbon County Area" (Jensen, 1988), and has been included as Appendix 2-2. An Order I soil survey was conducted of the Dugout Canyon Mine disturbed area in October and November 1995. Plate 2-2 illustrates the areal extent of the soils studied as part of the Order I soil survey, the location of the soil test pits excavated during the survey, and the extent of the identified soils.

Dan Larsen , Soil Scientist performed a survey of the Fan Portal area in 2003 and 2004. The 2003 survey was done in conjunction with a BLM environmental assessment for coal exploration holes. The 2004 survey was done on November 5, in conjunction with the proposed installation of the fan. A copy of the 2004 survey and a map showing the location of 2003 -2004 test pit locations is in Appendix 2-3.

222.200 Soil Identification

Following is a list of the soils found in and adjacent to the permit area. Their corresponding map units as illustrated on Plate 2-1 are also listed.

Map Unit	Soil Identification
3	Badland-Rubbleland-Rock outcrop complex
6	Beje-Comodore complex
7	Beje-Trag complex
13	Cabba family-Guben-Rock outcrop complex
21	Croydon loam, 8 to 30 percent slopes
23	Curecanti family - Pathead complex
32	Frandsen-Gullied land complex
33	Gerst-Badland-Rubbleland complex, 15 to 50 percent slopes
36	Gerst-Strych-Badland complex, 3 to 50 percent slopes
37	Gerst-Strych-Badland complex, 50 to 70 percent slopes

46	Guben-Pathead extremely stony loams
47	Guben-Rock outcrop complex
50	Haverdad loam, moist, 1 to 5 percent slopes
52	Hernandez family, 3 to 8 percent slopes
53	Hernandez family, moist, 1 to 6 percent slopes
62	Midfork family-Comodore complex
66	Mivida gravelly fine sandy loam, 3 to 8 percent slopes
72	Pathead-Corecanti family association
75	Perma family, 15 to 40 percent slopes
81	Persayo-Greybull complex
84	Podo-Rock outcrop complex
86	Rabbitex-Doney family-Midfork family complex
88	Rabbitex family-Datino Variant complex
96	Rock outcrop-Rubbleland-Travessilla complex
97	Rottulee family-Trag complex
100	Senchert loam, 3 to 15 percent slopes
101	Senchert loam, 30 to 50 percent slopes
103	Senchert-Toza family complex
105	Senchert family-Senchert complex
107	Supert-Winetti complex
109	Silas-Brycan loams
113	Strych very stony loam, 3 to 15 percent slopes

According to the SCS (Jensen, 1988), soils present on the east facing slopes of Dugout Canyon are part of the Rock outcrop-Rubbleland-Travessilla complex while those on the west facing slopes are part of the Croydon loam and Midfork family-Comodore complex.

However, observation of the soils present on the west and northwest facing slopes suggest that inclusions of the Comodore-Datino Variant complex are prevalent throughout. The conclusion that Comodore-Datino Variant complex soils are present in this area is based on the presence of characteristics typical of these soils such as: 40 to 60 percent slopes, elevations of slopes between 6800 and 8100 feet, 40 to 60 percent slopes, Douglas-fir and related vegetation, and very stony, relatively shallow soils. A telephone conversation between Mr. Chris D. Hansen of Canyon Fuel Company, LLC, Ms. Vicky Bailey of EarthFax Engineering, Inc. and Mr. Leland Sausser of the Natural Resources Conservation Service concerning the presence of Comodore-Datino Variant complex soils within areas mapped as Croydon loam occurred on March 3, 1998. Mr. Sausser

briefly reviewed available maps and photos and agreed that this may indeed occur but the maps in the Soil Survey of Carbon Area, Utah (Jensen, 1988) are generally correct as published.

Soils present in the narrow V-shaped Dugout Canyon that lie within the disturbed area of the mine have been identified and characterized. A large portion of the mine area is covered with overburden that consists of soil mixed with coal waste and/or waste rock from previous mining operations at the site. In these areas, the original soil structure has been obliterated or the native soils have been deeply covered. The remainder of the disturbed area has soils that appear to be in-place or have been only slightly disturbed. The approximate boundary between the overburden and in-place and/or slightly disturbed soils is illustrated on Plate 2-2. The overburden has been labeled on Plate 2-2 as OB while the in-place soils have been labeled as TS.

The overburden is a mixture of rock and/or coal waste with Travessilla soils. The Travessilla soils are classified as loamy, mixed (calcareous) mesic, Lithic Ustic Torriorthents (Jensen, 1988). Soil type TS is a loamy, mixed, Typic Haploboroll.

In Pace Canyon the site is mapped as being soil map Unit 96 and the adjacent soils being map Units 21, 84 and 97 (SCS, 1988).

222.300 Soil Description

The description of the soils has been based on the following information: taxonomic classification, horizon name and depth, color, texture (percent sand, silt, and clay), class, structure, percent rock fragments and organic matter, pH, EC, and solubility of calcium, magnesium, and sodium. This information is included in the soil test pit logs in Appendix 2-3 and the lab data sheets included in Appendix 2-4. The description of soils outside the disturbed area boundary or on the steep slopes within the boundary have been taken from the SCS (Jensen, 1988).

Overburden. The overburden (disturbed soils) are located both east and west of Dugout Creek in areas where previous mining activities have occurred (Plate 2-2). Much of the Dugout Canyon

Mine disturbed area is covered with overburden. Four test soil pits, TP-2, 3, 9, and 11 were excavated in overburden areas and their locations are illustrated on Plate 2-2. The overburden material could loosely be termed a "gravelly loam" that generally consist of loam mixed with coal debris, wood fragments, bricks and rock. The rock concentration varies between 10 and 40 percent and varies in size from gravel to boulder. Rock fragments are composed of sandstone with some siltstone blocks. This material is found in the relatively flat areas and on most of the steep slopes; is moderately well drained; and supports sagebrush, juniper, rabbit brush, and a variety of grasses. Thickness of this material varies from a few feet to more than eight feet. Select samples of the soil mixed with the rock were obtained and analyzed for the following parameters.

pH
Electrical Conductivity (EC)
Saturation Percent
Calcium (soluble)
Magnesium (soluble)
Sodium (soluble)
Sodium Absorption Ratio (SAR)
Total Sulfur
Acid/Base Potential
Total Organic Carbon
Phosphate
Nitrogen (nitrate)
Boron
Selenium
Available Sodium
Exchangeable Sodium
Alkalinity
Total Kjeldahl Nitrogen
Water Holding Capacity
Percent Coarse Fragment, Sand, Silt, and Clay

Results of the laboratory analyses of the samples have been summarized in Table 2-1.

A typical profile of this overburden was compiled from the soil descriptions from three soil test pits TP-2, TP-3, and TP-11. A fourth pit, TP-9, was excavated adjacent to the mine access road in an area labeled as overburden. However, within a few feet of ground surface and beneath the road

base, the material appeared to be undisturbed. Therefore, the information from this pit was not used to describe the overburden present at the mine.

The overburden consists of very dark gray (2.5Y 3/1) loam mixed with coal, wood, gravel, and cobble from 0 to 3 feet. The loam is dry to slightly damp, slightly alkaline with an average pH of 7.3, and an average concentration of the following parameters: EC value of 0.38 mmhos/cm, soluble calcium concentration of 1.78 meq/l, soluble magnesium concentration of 1.47 meq/l, soluble. sodium concentration of 0.51 meq/l, SAR value of 0.40, acid/base potential of 72.3 tons of calcium carbonate/tons of material, boron concentration of 0.42, selenium concentration less than 0.02 ppm, and water holding capacity of 8.6%. The percentage of rock is approximately 20% or more. This unit overlies brown (7.5YR 4/4) to dark grayish brown (10YR 4/2) loam with some coal waste, gravel and cobbles, and some wood fragments. This underlying unit extends to depth of at least eight feet in portions of the disturbed area. The concentration of coal waste appears to decrease with depth while rockiness increases. The percentage of rockiness ranges from 20 to 40%. The loam is dry to moist, slightly alkaline with a pH of 7.4, has an EC value of 0.37 mmhos/cm, soluble calcium concentration of 1.10 meq/l, soluble magnesium concentration of 2.00 meq/l, soluble sodium concentration of 0.50 meq/l, an SAR value of 0.40, an acid/base potential of 16.6 tons of calcium carbonate/tons of material, a boron concentration of 0.48 ppm, a selenium concentration less than 0.02 ppm, and a water holding capacity of 7.9%.

Soil Type TS. Soil type TS is found on both sides of Dugout Creek in the northeastern portion of the disturbed area and in the southwestern portions of the disturbed area by the sediment pond (Plate 2-2). TS soils in the sediment pond area appear to have been previously disturbed, resulting in the mixing of the soil horizons. The TS soils are found in flat lying areas and on slopes with grades up to 40% or more (Plate 2-2). The soil supports vegetation consisting of sagebrush, cottonwood, gambel oak, grass, pinyon, and fir. This soil consists of well drained soils that have formed in colluvium and residuum from sandstone, siltstone, and shale. Samples from this soil were obtained from soil pits TP-1, 4, 5, 6, 7, and 8. Soil test pits 14 and 14A were excavated and described and soil thickness were used to estimate available borrow material. However, soil

sample analysis results are not available for TP-14 and TP-14A and, therefore, have not been included in the M&RP. The samples obtained from TP-1, 4, 5, 6, 7, and 8 were analyzed for the same parameters listed for the overburden samples. Results of the analyses are summarized in Table 2-1. This soil type is undoubtedly a unit of the Datino Variant (Jensen, 1988).

The following description of the TS soil has been condensed from the information from soil test pit TP-4, TP-6 and the lower sections of TP-1. Similar soils were found in TP-5 and TP-8 but portions of the soil profile appeared to have been reworked by Dugout Creek. Also, the upper four feet of the soil profile in TP-1 appear to have been disturbed.

The TS soil generally has a surficial O1 horizon that is approximately 1 inch thick and is comprised of leaves, twigs, roots, silt, and sand. No samples of this horizon were obtained for analysis.

The A1 soil horizon occurs from 1 inch to a depth of 5 inches. This soil horizon is a gravelly loam composed of approximately 50% sand, 35% silt, and 15% clay; rock fragments compose about 36% (gravels) of its volume. The A1 horizon has a dark gray color (10YR 3/1) when moist. The soil is slightly acidic with a pH of 6.9 and has an EC value of 0.52 mmhos/cm, soluble calcium concentration of 4.30 meq/l, soluble magnesium concentration of 0.91 meq/l, soluble sodium concentration of 0.30 meq/l, an SAR value of 0.19, an acid/base potential of 78.4 tons of calcium carbonate/tons of material, a boron concentration of 0.51 ppm, a selenium concentration less than 0.02 ppm, and a water holding capacity of 11.4%.

The A1 soil is underlain by a very dark gray (10YR 3/1) B2 soil horizon. The B2 soil occurs at a depth of 5 to 14 inches. It is also a gravelly loam with approximately 48% sand, 35% silt, and 17% clay. Rock fragments compose about 30% by volume (gravel) of this soil horizon. The soil has a neutral acidity/alkalinity with a pH of 7.0 and has an EC value of 0.53 mmhos/cm, soluble calcium concentration of 3.84 meq/l, soluble magnesium concentration of 1.24 meq/l, soluble sodium concentration of 0.35 meq/l, an SAR value of 0.22, an acid/base potential of 79.0 tons of calcium

TABLE 2-1

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-1 0.1-0.5	TP-1 0.5-2.2	TP-1 2.2-4.2	TP-1 4.2-4.7
pH		4.5 - 9.0	6.9	7.1	7.3	7.3
EC	mmhos/cm	0 - 15	0.54	0.37	0.33	0.31
SATURATION	%	25 - 80%	41.4	32.8	33.6	32.1
SAR		0 - 12, 15	0.23	0.37	0.4	0.4
CALCIUM	meq/l	na	3.42	2.31	1.90	1.89
MAGNESIUM	meq/l	na	1.37	0.80	0.85	0.78
SODIUM	meq/l	na	0.36	0.46	0.47	0.46
COARSE FRAGMENTS	%	na	17.8	35.2	22.6	72.9
SAND	%	na	50.2	47.2	38.2	45.2
SILT	%	na	36.0	33.8	41.8	35.0
CLAY	%	na	13.8	19.0	20.0	19.8
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	7.3	9.4	9.3	10.4
BORON	mg/kg	< 5.0	0.32	0.32	0.27	0.25
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.04	0.02	0.03	0.04
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	19.8	16.2	95.5	101
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	18.5	15.5	94.5	99.4
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOI L	TOPSOIL
TEXTURE [5]		na	L	L	L	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-1 4.7-8.0	TP-2 1.3-4.3	TP-3 0.6-3-3	TP-3 3.3-8.0
pH		4.5 - 9.0	7.4	7.4	7.1	7.4
EC	mmhos/cm	0 - 15	0.29	0.39	0.37	0.37
SATURATION	%	25 - 80%	29.1	28.7	31.3	32.1
SAR		0 - 12, 15	0.37	0.46	0.34	0.40
CALCIUM	meq/l	na	1.59	1.71	1.85	1.10
MAGNESIUM	meq/l	na	0.89	1.53	1.42	2.00
SODIUM	meq/l	na	0.41	0.58	0.44	0.50
COARSE FRAGMENTS	%	na	35.9	50.6	25.1	59.1
SAND	%	na	44.2	50.4	43.4	36.4
SILT	%	na	39.0	30.8	37.8	39.8
CLAY	%	na	16.8	18.8	18.8	23.8
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	11.5	13.0	10.2	11.0
BORON	mg/kg	< 5.0	0.12	0.25	0.54	0.48
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.03	0.02	0.07	0.03
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	79.8	96.8	50.7	17.5
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	78.9	96.2	48.5	16.6
SAMPLE TYPE [4]		na	TOPSOIL	OB	OB	OB
TEXTURE [5]		na	L	L	L	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-4 0.1-0.4	TP-4 0.4-1.2	TP-4 1.2-2.3	TP-5 0.3-1.4
pH		4.5 - 9.0	6.9	7.0	7.2	7.0
EC	mmhos/cm	0 - 15	0.52	0.53	0.36	0.41
SATURATION	%	25 - 80%	40.9	37.8	32.9	38.4
SAR		0 - 12, 15	0.19	0.22	0.30	0.40
CALCIUM	meq/l	na	4.30	3.84	2.25	2.44
MAGNESIUM	meq/l	na	0.91	1.24	1.02	0.80
SODIUM	meq/l	na	0.30	0.35	0.38	0.38
COARSE FRAGMENTS	%	na	35.7	30.5	21.8	0.0
SAND	%	na	50.4	48.6	53.2	48.6
SILT	%	na	34.8	34.6	31.8	34.4
CLAY	%	na	14.8	16.8	15.0	17.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	11.8	13.8	9.2	11.8
BORON	mg/kg	< 5.0	0.51	0.63	0.88	0.80
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.08	0.07	0.01	0.02
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	80.9	81.2	115	27.6
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	78.4	79.0	115	26.9
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	L	SL	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-5 1.4-2.7	TP-5 2.7-5.2	TP-5 2.7-5.2
pH		4.5 - 9.0	7.3	7.3	7.5
EC	mmhos/cm	0 - 15	0.36	0.33	0.34
SATURATION	%	25 - 80%	30.7	30.6	27.9
SAR		0 - 12, 15	0.50	0.50	0.50
CALCIUM	meq/l	na	1.95	1.73	1.62
MAGNESIUM	meq/l	na	0.71	0.76	0.80
SODIUM	meq/l	na	0.46	0.55	0.56
COARSE FRAGMENTS	%	na	0.0	14.7	7.0
SAND	%	na	47.6	56.6	50.4
SILT	%	na	36.4	27.4	32.6
CLAY	%	na	16.0	16.0	17.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	11.6	11.8	10.3
BORON	mg/kg	< 5.0	0.72	0.42	0.33
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.02	0.01	0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	116	85.2	174
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	116	84.9	174
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	SL	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-6 0.0-7.0	TP-6 7.0-30.0	TP-6 30.0-49.0	TP-6 49.0-81.0
pH		4.5 - 9.0	7.5	7.8	7.8	7.9
EC	mmhos/cm	0 - 15	0.59	0.40	0.34	0.39
SATURATION	%	25 - 80%	37.7	30.6	33.1	34.2
SAR		0 - 12, 15	0.40	0.51	0.62	0.58
CALCIUM	meq/l	na	3.82	2.27	1.77	1.63
MAGNESIUM	meq/l	na	1.19	0.77	0.71	1.34
SODIUM	meq/l	na	0.64	0.63	0.69	0.71
COARSE FRAGMENTS	%	na	11.9	25.0	6.9	0.00
SAND	%	na	56.0	59.0	45.0	52.0
SILT	%	na	32.0	29.0	39.0	31.0
CLAY	%	na	12.0	12.0	16.0	17.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	10.6	8.6	10.2	9.5
BORON	mg/kg	< 5.0	0.39	0.33	0.30	0.42
SELENIUM	mg/kg	< 0.1	0.02	0.02	0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	0.06	0.03	0.04	0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	90.9	69.8	95.4	159
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	89.0	68.8	94.1	158
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	SL	SL	L	SL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-7 0-3.0	TP-7 3.0-10.0	TP-7 10.0-20.0
pH		4.5 - 9.0	7.3	7.8	7.8
EC	mmhos/cm	0 - 15	1.51	0.68	0.40
SATURATION	%	25 - 80%	43.5	30.9	25.8
SAR		0 - 12, 15	0.20	0.46	0.44
CALCIUM	meq/l	na	8.36	3.43	2.25
MAGNESIUM	meq/l	na	3.56	1.19	0.98
SODIUM	meq/l	na	0.48	0.70	0.56
COARSE FRAGMENTS	%	na	26.2	61.6	58.2
SAND	%	na	50.0	50.0	51.0
SILT	%	na	33.0	31.0	31.0
CLAY	%	na	17.0	19.0	18.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	14.6	9.6	9.2
BORON	mg/kg	< 5.0	0.47	0.44	0.22
SELENIUM	mg/kg	< 0.1	0.02	0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	0.05	0.04	0.03
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	51.4	80.0	85.1
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	49.9	78.7	84.1
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	L	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-7 20.0-74.0	TP-7 74.0-84.0	TP-7 84.0-144.0
pH		4.5 - 9.0	7.9	8.2	8.3
EC	mmhos/cm	0 - 15	0.34	0.47	0.45
SATURATION	%	25 - 80%	27.9	36.8	27.4
SAR		0 - 12, 15	0.91	0.64	0.65
CALCIUM	meq/l	na	1.36	1.33	1.03
MAGNESIUM	meq/l	na	0.83	2.61	2.87
SODIUM	meq/l	na	0.95	0.90	0.91
COARSE FRAGMENTS	%	na	53.0	49.1	72.3
SAND	%	na	52.0	46.0	52.5
SILT	%	na	29.0	33.0	28.7
CLAY	%	na	19.0	21.0	18.8
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	10.3	16.2	13.1
BORON	mg/kg	< 5.0	0.19	0.44	0.45
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	<0.01	0.03	0.04
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	66.6	76.2	108.0
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	66.6	75.3	107.0
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	SL	L	SL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-8 2.0-8.0	TP-8 8.0-15.0	TP-8 15.0-25.0
pH		4.5 - 9.0	7.7	7.8	7.7
EC	mmhos/cm	0 - 15	0.47	0.43	0.38
SATURATION	%	25 - 80%	41.8	29.5	29.8
SAR		0 - 12, 15	0.43	0.36	0.33
CALCIUM	meq/l	na	2.78	2.76	2.63
MAGNESIUM	meq/l	na	0.66	0.61	0.55
SODIUM	meq/l	na	0.56	0.47	0.42
COARSE FRAGMENTS	%	na	0.0	20.4	18.3
SAND	%	na	33.0	62.0	70.0
SILT	%	na	49.0	27.0	20.0
CLAY	%	na	18.0	11.0	10.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	9.1	7.0	8.2
BORON	mg/kg	< 5.0	0.65	0.35	0.51
SELENIUM	mg/kg	< 0.1	0.02	0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	0.05	0.03	0.02
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	85.2	89.2	91.8
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	83.6	88.3	91.1
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	SL	SL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-8 25.0-33.5	TP-8 33.5-48.0	TP-8 48.0-56.0
pH		4.5 - 9.0	7.7	7.8	7.9
EC	mmhos/cm	0 - 15	0.36	0.33	0.36
SATURATION	%	25 - 80%	35.8	36.1	33.9
SAR		0 - 12, 15	0.46	0.63	0.52
CALCIUM	meq/l	na	2.13	1.76	1.84
MAGNESIUM	meq/l	na	0.58	0.54	0.71
SODIUM	meq/l	na	0.53	0.67	0.58
COARSE FRAGMENTS	%	na	18.6	6.9	19.7
SAND	%	na	51.0	50.0	48.0
SILT	%	na	37.0	34.0	38.0
CLAY	%	na	12.0	16.0	14.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	11.0	8.70	10.2
BORON	mg/kg	< 5.0	0.65	0.59	0.49
SELENIUM	mg/kg	< 0.1	<0.02	0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.02	0.02	0.03
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	21.7	70.0	70.0
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	21.1	69.3	69.1
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	L	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-9 0.0-23.0	TP-9 23.0-37.0	TP-9 37.0-58.0
pH		4.5 - 9.0	7.8	8.1	8.0
EC	mmhos/cm	0 - 15	0.35	0.37	0.28
SATURATION	%	25 - 80%	27.7	23.3	34.2
SAR		0 - 12, 15	0.52	0.69	0.62
CALCIUM	meq/l	na	2.08	1.27	1.35
MAGNESIUM	meq/l	na	0.48	1.19	0.66
SODIUM	meq/l	na	0.59	0.76	0.62
COARSE FRAGMENTS	%	na	14.0	0.0	0.0
SAND	%	na	71.0	72.0	47.0
SILT	%	na	21.0	20.0	39.0
CLAY	%	na	38.0	8.0	14.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	6.8	6.5	10.2
BORON	mg/kg	< 5.0	0.22	0.18	0.21
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.03	0.01	0.03
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	123	185	74.2
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	122	185	73.3
SAMPLE TYPE [4]		na	OB	TOPSOIL	TOPSOIL
TEXTURE [5]		na	SL	SL	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-11 0.0-6.0	TP-11 6.0-25.0	TP-11 25.0-75.0	TP-11 75.0-84.0
pH		4.5 - 9.0	7.7	7.7	6.6	8.0
EC	mmhos/cm	0 - 15	0.43	0.30	0.46	0.34
SATURATION	%	25 - 80%	32.2	31.1	48.5	27.7
SAR		0 - 12, 15	0.54	0.73	0.54	0.69
CALCIUM	meq/l	na	2.12	1.36	2.11	1.19
MAGNESIUM	meq/l	na	0.80	0.71	2.03	1.56
SODIUM	meq/l	na	0.65	0.75	0.78	0.81
COARSE FRAGMENTS	%	na	0.0	0.0	0.0	0.0
SAND	%	na	62.0	54.0	62.0	56.0
SILT	%	na	26.0	32.0	26.0	30.0
CLAY	%	na	12.0	14.0	12.0	14.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	11.5	13.0	10.2	11.0
BORON	mg/kg	< 5.0	0.12	0.25	0.54	0.48
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.04	0.04	0.16	<0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	21.1	34.0	18.6	78.7
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	19.9	32.8	13.6	78.7
SAMPLE TYPE [4]		na	TOPSOIL	OB	OB	OB
TEXTURE [5]		na	L	L	L	L

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]		
			TP-13 0.0-38.0	TP-13 38.0-62.0	TP-13 62.0-80.0
pH		4.5 - 9.0	7.5	7.6	7.7
EC	mmhos/cm	0 - 15	0.56	0.52	0.59
SATURATION	%	25 - 80%	26.6	32.5	23.2
SAR		0 - 12, 15	0.47	0.39	0.36
CALCIUM	meq/l	na	3.70	3.31	4.02
MAGNESIUM	meq/l	na	1.15	1.12	1.04
SODIUM	meq/l	na	0.57	0.58	0.75
COARSE FRAGMENTS	%	na	5.8	4.9	5.6
SAND	%	na	46.0	45.0	58.8
SILT	%	na	37.0	36.0	25.0
CLAY	%	na	17.0	19.0	16.2
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	12.2	13.7	4.9
BORON	mg/kg	< 5.0	0.30	0.32	0.17
SELENIUM	mg/kg	< 0.1	0.02	0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.02	<0.01	<0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	6.95	22.7	46.4
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	6.32	22.7	46.4
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	L	SL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-15 2.0-8.0	TP-16 0.0-1.5	TP-16 1.5-3.5	TP-16 3.5-12.0
pH		4.5 - 9.0	7.7	7.2	7.3	7.2
EC	mmhos/cm	0 - 15	0.55	0.77	0.50	0.68
SATURATION	%	25 - 80%	30.6	30.3	31.5	30.2
SAR		0 - 12, 15	0.38	0.31	0.49	0.39
CALCIUM	meq/l	na	3.75	4.15	2.71	3.90
MAGNESIUM	meq/l	na	0.89	1.77	1.00	1.05
SODIUM	meq/l	na	0.58	0.54	0.67	0.62
COARSE FRAGMENTS	%	na	18.4	6.0	5.4	20.0
SAND	%	na	44.0	52.0	49.0	44.0
SILT	%	na	37.0	29.0	26.0	25.0
CLAY	%	na	19.0	19.0	25.0	31.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	12.3	11.6	8.3	8.7
BORON	mg/kg	< 5.0	0.16	0.27	0.23	0.31
SELENIUM	mg/kg	< 0.1	0.02	<0.02	0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	0.04	0.02	0.02	0.02
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	73.0	9.20	6.32	7.19
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	71.7	8.57	5.70	6.56
SAMPLE TYPE [4]		na	TOPSOIL	TOPSOIL	TOPSOIL	TOPSOIL
TEXTURE [5]		na	L	SL	SCL	CL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH [1]			
			TP-17 0.7-1.7	TP-17 1.7-4.7	TP-17 4.7-9.7	TP-17 9.7-29.5
pH		4.5 - 9.0	7.3	7.1	7.2	7.3
EC	mmhos/cm	0 - 15	0.50	0.50	0.47	0.34
SATURATION	%	25 - 80%	26.2	32.5	33.2	24.4
SAR		0 - 12, 15	0.51	0.45	0.47	0.54
CALCIUM	meq/l	na	2.45	3.14	3.18	1.94
MAGNESIUM	meq/l	na	0.78	0.80	0.88	0.49
SODIUM	meq/l	na	0.64	0.64	0.66	0.59
COARSE FRAGMENTS	%	na	19.1	0.9	0.7	1.4
SAND	%	na	70.0	66.0	64.0	68.0
SILT	%	na	14.0	16.0	18.0	14.0
CLAY	%	na	16.0	18.0	18.0	18.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	3.3	3.4	4.8	3.6
BORON	mg/kg	< 5.0	0.16	0.21	0.23	0.11
SELENIUM	mg/kg	< 0.1	<0.02	<0.02	<0.02	<0.02
ACID POTENTIAL (% SULFUR)	%	na	0.02	0.03	<0.01	<0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) [2]	tons $CaCO_3$/ 1,000 tons material	na	250	177	151	144
ACID/BASE POTENTIAL [3]	tons $CaCO_3$/ 1,000 tons material	> -5	250	176	151	144
SAMPLE TYPE [4]		na	SOIL	SOIL	SOIL	SOIL
TEXTURE [5]		na	SL	SL	SL	SL

TABLE 2-1 (Continued)

SELECT DUGOUT CANYON MINE SOIL ANALYTICAL DATA

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	SAMPLE NUMBER AND DEPTH (1)		
			TP-17 29.5-31.0	TP-17 31.0-46.3	TP-17 46.3-60.0
pH		4.5 - 9.0	7.1	7.3	7.3
EC	mmhos/cm	0 - 15	0.55	0.38	0.40
SATURATION	%	25 - 80%	43.6	27.5	31.80
SAR		0 - 12, 15	0.48	0.65	0.59
CALCIUM	meq/l	na	4.00	2.37	2.73
MAGNESIUM	meq/l	na	0.75	0.51	0.52
SODIUM	meq/l	na	0.73	0.78	0.75
COARSE FRAGMENTS	%	na	0.0	0.2	4.7
SAND	%	na	27.0	55.0	48.0
SILT	%	na	47.0	25.0	28.0
CLAY	%	na	26.0	20.0	24.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	9.3	5	5
BORON	mg/kg	< 5.0	0.29	0.14	0.22
SELENIUM	mg/kg	< 0.1	0.02	<0.02	0.02
ACID POTENTIAL (% SULFUR)	%	na	<0.01	0.01	0.01
NEUTRALIZATION POTENTIAL (% $CaCO_3$) (2)	tons $CaCO_3$/ 1,000 tons material	na	116	159	143
ACID/BASE POTENTIAL (3)	tons $CaCO_3$/ 1,000 tons material	> -5	116	159	143
SAMPLE TYPE (4)		na	SOIL	SOIL	SOIL
TEXTURE (5)		na	L	SCL	SCL

(1) Depth of sample in inches below ground surface.
(2) $CaCO_3$ shown on IML lab data sheets as Neut. Pot. X 0.10. (i.e. Sample 129266 $CaCO_3$ = 19.8 X 0.1 = 1.98)
(3) Acid/Base potential (ABP) calculation based on ABP = NP - AP, where NP is neutralization potential and AP is acid potential, NP = % $CaCO_3$ X 10 = tons of $CaCO_3$/tons of material, and AP = % S X 31.24 = tons of $CaCO_3$/tons of material.
(4) OB - Overburden
(5) Textural Classes: L - loam; SL - sand loam; LS - loamy sand, CL - clayey loam, SCL - sandy clayey loam.

carbonate/tons of material, a boron concentration of 0.63 ppm, a selenium concentration less than 0.02 ppm, and a water holding capacity of 9.8 %.

The B2 soil is underlain by a dark yellowish brown (10YR 4/4) B3 soil horizon. The B3 soil occurs at a depth of 14 to 28 inches. It is a gravelly sandy loam with approximately 53% sand, 32% silt, and 15% clay. Rock fragments compose about 22% by volume (gravel) of this soil horizon. The soil is slightly alkaline with a pH of 7.2 and has an EC value of 0.36 mmhos/cm, soluble calcium concentration of 2.25 meq/l, soluble magnesium concentration of 1.02 meq/l, soluble sodium concentration of 0.38 meq/l, an SAR value of 0.30, an acid/base potential of 115 tons of calcium carbonate/tons of material, a boron concentration of 0.88 ppm, a selenium concentration less than 0.02 ppm, and a water holding capacity of 6.5%.

The B3 soil is underlain by a pale brown (10YR 6/3) to brown (10YR 4/3) C soil horizon. The C soil occurs at 28 inches to at least 9 feet in the area of TP-4 and TP-5. It is typically a gravelly sandy loam to cobbly sandy loam. The sand and coarse fraction increase with depth. A sample of the C horizon was obtained from TP-1 for analysis. The results indicate that the soil is slightly alkaline with a pH of 7.4 and has an EC value of 0.29 mmhos/cm, soluble calcium concentration of 1.59 meq/l, soluble magnesium concentration of 0.89 meq/l, soluble sodium concentration of 0.41 meq/l, an SAR value of 0.37, an acid/base potential of 78 tons of calcium carbonate/tons of material, a boron concentration of 0.12 ppm, a selenium concentration less than 0.02 ppm, and a water holding capacity of 5.3%.

Croydon loam, 8 to 30 percent slopes. This loam has been mapped by the SCS (Jensen, 1988) as being present on the west, north, and east facing slopes of lower Dugout Canyon and it tributaries. According to the SCS (Jensen, 1988), this unit generally consists of a surface layer of dark yellowish brown and yellowish brown loam about 16 inches thick. The subsurface layer is approximately 7 inches of very pale brown loam. The subsoil to a depth of 48 inches is light yellowish brown clay loam over weathered sandstone. Vegetation
typically consists of quaking aspen, blue wildrye, slender wheatgrass, peavine, bearded wheatgrass, and silver sagebrush. The soil is typically found at elevations between 7800 to 9500 feet. A description of the Croydon loam has been included in Appendix 2-2.

Comodore-Datino Variant complex. This soil type appears to be present as inclusions within areas mapped by the SCS (Jensen, 1988) as Croydon loam on the west facing slopes of Dugout Canyon. This unit is 50 percent Comodore very stoney fine sandy loam, moist, 50 to 60 percent slopes; 35 percent Datino Variant extremely stoney fine sandy loam, 40 to 60 percent slopes; and 15 percent other soils. The Comodore soil is on the side slopes while the Datino Variant is on the toe slopes. The Comodore is shallow and well drained. It formed in colluvium derived dominantly from sandstone and shale. The Datino Variant soil is very deep and well drained. It formed in colluvium derived dominantly from sandstone and shale. A description of the Comodore and Datino Variant units has been included in Appendix 2-2.

Rock outcrop-Rubbleland-Travessilla complex. This soil type is present on the east facing slopes of Dugout Canyon and Pace Canyon. It is 35 percent Rock outcrop; 30 percent Rubbleland; 25 percent Travessilla very gravelly fine sandy loam, 30 to 70 percent slopes; and 10 percent other soils. The Rock outcrop is typically exposed sandstone. Rubbleland is areas of stones and boulders that are virtually free of vegetation. The Travessilla soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone. A description of the Travessilla complex soil has been included in Appendix 2-2.

222.400 Soil Productivity

In areas where soils have been significantly disturbed by previous mining activities, the soils have lost their native identities and now typically contain waste rock and/or coal waste. As discussed in Section 222.300, these soils are referred to as overburden. Analysis of the loam within the overburden indicates that this material, with proper treatment, could be considered as productive soil. As illustrated in Table 2-1, with the exception of the percentage of rock fragments, the overburden has physical and chemical properties that are within the current "acceptable range" for the parameters listed on Table 2, "Overburden Evaluation for Vegetative Root Zone" which is contained in the Division's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining" (Leatherwood, 1988). The treatments proposed to improve the productivity of the overburden are discussed in Section 224.

The undisturbed or slightly disturbed soils in the mine area currently sustain good vegetative cover. The results of the soil analyses indicate these soils also have physical and chemical characteristics that are within the Division's "acceptable range" for vegetative root zones (Leatherwood, 1988). Vegetation associated with these soils and the overburden is discussed in Chapter 3 of this M&RP. Refer to Section 321.100 which contains 1996 reported living cover percentages, representative of the productivity of the land prior to this mining operation.

The majority of the soils at the fan portal site have been significantly disturbed by previous activities, the soils have lost their native identities and now typically contain a percentage of coal and waste rock. The site soils to be striped and used as topsoil are representative of the area and there is no evidence of any unusual properties that would cause problems with reclamation revegetation. Vegetation associated with these fan portal area soils is discussed in Chapter 3 of this M&RP and in the report prepared by Mt. Nebo Scientific (April 2004) located in Appendix 3-4.

223 Soil Characterization

The soil survey described in this chapter was performed in accordance with the standards of the National Cooperative Soil Survey.

224 Substitute Topsoil

SCM proposes to use the soils from the water tank area, coal storage area, the sediment pond area and the slope between the sediment pond and facilities pad as substitute topsoil/growth media during reclamation in Dugout Canyon. This material will be used, in conjunction with topsoil salvaged and stored during the operational phase of the mine, for reclamation of the disturbed area. Waste will be segregated from the material. Material heavily contaminated with coal waste will not be used as substitute topsoil but will be properly disposed of. It is anticipated that during the reclamation of the disturbed area, approximately 6,504 CY of substitute topsoil could be generated from the overburden within the facilities areas (Area #1, Plate 2-2). The material from these areas would only be utilized for substitute topsoil after they have been deemed suitable for

use. The suitability of the soils will be determined through sampling and analysis as discussed in Section 233.200. It is important to note that the potential volume of material from this area has not been included in the calculations of available topsoil/growth media presented in Section 242.

The B anc C horizon soils from the area adjacent to the water tank area and west slope of Dugout Creek (Area #2, Plate 2-2), coal storage area (Area #3, Plate 2-2), and the sediment pond area and the slope between the pond and facilities area (Area # 4A, Plate 2-2), will also be used as substitute topsoil material. As discussed in Section 222.400, with the exception of the coarse fragment concentration, the physical and chemical properties of the overburden and B and C horizon soils fall within the current "acceptable range" for substitute topsoil (Leatherwood, 1988). At the time of final reclamation, these soil resources will be supplemented with appropriate fertilizers and amendments (Section 230).

Pace Canyon fan portal site will be reclaimed with soils salvaged at the site prior to construction, as noted above the site is previously disturbed and the majority of the soils contain coal and waste rock.

230 OPERATION PLAN

231 General Requirements

231.100 Removing and Storing Soil Methods

The Dugout Canyon Mine area has been the site of infrequent mining activities since 1925. At the time of the initial disturbances, topsoil was apparently not salvaged. Therefore, only a small percentage of the mine area can be considered undisturbed. As illustrated on Plate 2-2, much of the area is covered with overburden. The methods described for topsoil salvage herein will be followed when removing and storing soil resources necessitated as a result of construction of new surface operations in undisturbed areas.

In the areas designated on Plate 2-2, soil salvage will take place where disturbances are anticipated to occur or where removal of the resource would provide the best method of protection.

Where possible, the removal of salvaged soils will be as follows: the first lift will include the A horizon material (topsoil) and the second lift will include the B and C horizons. Each of these lifts will be stored as noted in Section 231.400. These materials will be stored in stockpiles graded to maximum slopes of 2:1 and seeded to promote surface stabilization. The seed mix to be used will be the interim seed mix described in Chapter 3.

In Area #2 , the operator will endeavor to remove and store as much topsoil and/or substitute topsoil as possible. Material suitable for reclamation removed from this area will be stored in the designated topsoil stockpile.

The soils removed as part of the Dugout Creek culvert construction will be handled by first removing the large or coarse vegetation (i.e. trees and thick shrubs), followed by removal of the topsoil and remaining vegetation, then finally the removal of the underlying horizons. The soils removed during culvert construction and labeled as Area #5 on Plate 2-2 will be stored either separately from soils salvaged from the remainder of the area or within a designated location of the stockpile. Soils present on steep slopes will be removed as part of the culvert construction process only where doing so does not jeopardize the stability of the entire slope within or outside the disturbed area boundary or create safety hazards during culvert installation. Decisions regarding the removal of soil from steep slopes will be made in the field by a qualified soils scientist in agreement with the construction supervisor. This decision will be made based on the steepness of the slope, the potential for slope failure uphill of the disturbed area if soils are removed at the slope toe, and the timing within the construction sequence (i.e. can backfill be placed against the slope immediately after topsoil is removed to support the slope). Additional information regarding the location of the steep slopes and the areas of soil removal associated with the construction of the Dugout Creek culvert is provided in Appendix 2-5. After construction of the culvert, an as-built map will be submitted illustrating the locations where steep slope soils were removed.

In areas where topsoil thicknesses of less than 6 inches are encountered, the topsoil and underlying unconsolidated materials will be removed and stockpiled together, including the soil salvaged in Pace Canyon during construction of the fan portal site. The entire mixture will be treated as topsoil in compliance with R614-201-234.300. The recovery of topsoil and substitute topsoil will be maximized in both disturbed and undisturbed soils.

The substitute topsoil generated during mine construction, as discussed in Section 224, will be treated as topsoil and stored accordingly.

No facilities will be constructed and no soil disturbance is planned in conjunction with the incorporation of the SITLA lease (T13S R13E, Section 29, Portions of Section 17, 20, 21, 28 and 30) into the Dugout Canyon Mine permit area.

231.200 Suitability of Topsoil Substitutes/Supplements

See Section 233.200.

231.300 Testing of Topsoil Handling and Reclamation Procedures Regarding Revegetation

SCM will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes. Erosion control measures will include surface roughing and erosion mat placement on slope areas thought to be unstable. SCM will fill, regrade, or otherwise stabilize any rills or gullies deeper than nine (9) inches which form in areas which have been regraded and topsoiled. The areas adjacent to any rills or gullies which have been filled, regraded or otherwise stabilized, will be reseeded or stabilized accordingly.

Methods used to evaluate success of Revegetation and stabilization are discussed in Chapters 3 and 5.

231.400 Construction, Modification, Use, and Maintenance of Topsoil Storage Piles

Topsoil and substitute topsoil removed from the Dugout Canyon Mine will be transported and stockpiled at the Soldier Canyon Mine soils stockpile area (Plate 2-3). The estimated volumes of topsoil and substitute topsoil to be stockpiled are presented in Table 2-2.

It is anticipated that the pile will be constructed in horizontal lifts of 1.5 to 2.0 feet. Tracked equipment will be used to reduce compaction. As described in Section 231.100, the stockpile will be graded to a maximum slope of 2:1 and seeded to promote surface stabilization. Some of the vegetation removed during the construction of the Dugout Canyon Mine will be incorporated into or placed on top of the stockpile. The interim reclamation seed mix described in Chapter 3 will be used for this purpose. Volume calculations for the amount of topsoil to be removed and placed in the storage pile are included in Appendix 2-6.

The Dugout Canyon Mine topsoil will be labeled and kept separate from the Soldier Canyon Mine soils. A description of the Soldier Canyon Mine topsoil stockpile area can be found in that M&RP. The Soldier Canyon Mine M&RP will be modified to allow for the storage of Dugout Canyon Mine substitute topsoil prior to the transport of the soil. The stockpiles will be isolated from the main surface area to protect the material from contaminants and unnecessary compaction that would interfere with vegetation. A sign will be installed at the base of each stockpile to identify it as a topsoil storage area. The stockpiles will be protected from wind and water erosion by being revegetated with a quick growing vegetative cover (proposed interim reclamation seed mix) and by installing berms and/or silt fence below the stockpiles to help trap sediment coming off the stockpile. These stockpiled soils will not be moved or disturbed until required for redistribution during final reclamation.

Topsoil/growth medium salvaged from the Pace Canyon fan portal site will be stockpiled at the site (Plate PC5-2). Approximately 1,900 cubic yards of topsoil will be stripped from the site. The Topsoil Stockpile has been designed to hold over 2,000 cubic yards in case additional topsoil is discovered during stripping. Topsoil volume calculations and Topsoil Stockpile design calculations can be found in Appendix 2-9.

232 Topsoil and Subsoil Removal

232.100 Topsoil Removal and Segregation

All topsoil thicker than 6 inches will be removed as a separate layer from the subsoil, segregated, and stockpiled separately, if necessary. Topsoil less than 6 inches thick will be removed according to Section 232.300.

TABLE 2-2

TOPSOIL AND SUBSTITUTE TOPSOIL VOLUMES

AREA	MATERIAL TYPE	VOLUME
NORTHWEST FACILITIES AREA (AREA 2)	TOPSOIL/OVERBURDEN	1,653 CY
COAL STORAGE AREA (AREA 3)	TOPSOIL/SUBSOIL	4,869 CY
SEDIMENT POND, SLOPE AREA, AREAS BETWEEN ROAD AND CREEK (AREAS 4, 6, 7)	TOPSOIL/SUBSOIL	20,118 CY
WATER TANK AREA (AREA 8)	TOPSOIL/SUBSOIL	247 CY
SLOPE EAST OF COAL STORAGE PILE (AREA 9)	TOPSOIL/SUBSOIL	333 CY
GILSON WATER WELL*	TOPSOIL/SUBSOIL	191 CY
	TOTAL	27,411 CY

* Refer to Appendix 2-8 for volume calculations and location of soil.

Soil from the Dugout Creek channel walls removed during culvert construction will be stored separately from soils removed from other areas within the disturbed area or within designated areas of the stockpile.

If during construction activities additional topsoil is found, this material will be removed and stockpiled for use during reclamation activities. It is likely that material will be found in some areas marked on Plate 2-2 as OB.

As requested by the Division, a non-biased, third party, professional soil scientist will be on-site when available at the Dugout Canyon Mine facilities during soil salvage to monitor and supervise soil salvage operations for the purpose of maximizing soil salvage volumes and quantities.

At the Pace Canyon fan portal site, the topsoil and underlying unconsolidated materials will be removed and stockpiled together. The entire mixture will be treated as topsoil in compliance with R614-201-234.300. The recovery of topsoil/growth medium will be maximized at the site.

232.200 Poor Topsoil

Topsoil that is of an insufficient quantity, or of poor quality (for sustaining vegetation) will be removed as a separate layer and segregated. Such operations will be done with approval of the Division, and in compliance with R614-301-233.100 (Section 233.100).

232.300 Thin Topsoil

Topsoil to be removed that is less than 6 inches thick will be removed with the immediately underlying unconsolidated materials. This material mixture will be treated as topsoil.

232.400 Minor Disturbances Not Requiring Topsoil Removal

Small Structures. Topsoil will not be removed prior to construction that would result in only minor disturbances. Such construction activity includes work on small structures such as power poles, signs, fence lines, and other small structures.

Vegetation. The operator will not remove topsoil for minor disturbances where such activity will not destroy vegetation or cause erosion.

232.500 Subsoil Segregation

The B and C soil horizons removed during construction of the site will be stockpiled as described in Section 231.400.

232.600 Timing

Soil removal will take place after all vegetation that could interfere with soil salvage has been removed. Surface disturbance activities will take place after the topsoil has been removed.

232.700 Topsoil and Subsoil Removal Under Adverse Conditions

In areas of surface disturbance, topsoil and subsoil will each be removed separately and segregated, except where natural conditions render operations hazardous or detrimental to soils outside the disturbed area. ~~The only~~ One location within the permit area where soil is to be removed under adverse conditions is in the area of the culvert. This has been discussed in more detail in Section 231.100.

Conventional Machines. In localities where steep grades, adverse terrains, severe rockiness, limited depth of soils, or other adverse conditions exist that render soil removal and segregation activities using conventional machines hazardous, soils will not be salvaged and stockpiled.

Substitute Topsoil. Importing of substitute topsoil is not anticipated (Section 224). However, it is anticipated that fill will be imported to the site during construction. This material will be sampled and analyzed for acid and toxic characteristics prior to placement. Material found to be acid- and/or toxic-forming will not be imported.

233 Topsoil Substitutes and Supplements

233.100 Overburden Materials Supplementing and/or Replacing Topsoil

Selected overburden materials will be used as a supplement to topsoil during reclamation operations. Where overburden materials are used, the operator commits to demonstrating to the Division prior to topsoil emplacement that the resultant soil is suitable for supporting Revegetation efforts.

233.200 Suitability of Topsoil Substitutes and Supplements

At the time the Dugout Canyon area was first mined, no topsoil was segregated and saved. Topsoil and other fill material was apparently used in construction of the surface facilities pads and roads. Much of the topsoil appears to have been mixed with mining wastes (including the topsoil/growth medium in Pace Canyon). During the construction phase of the Dugout Canyon Mine facilities in Dugout Canyon, this material will be excavated and, where suitable, stockpiled for use as a topsoil substitute/growth media after treatment. The substitute topsoil/growth media will be placed after recontouring of the site has occurred during reclamation activities. The exact quantity of the substitute topsoil/growth media available for use is not known at this time but has been estimated to be at least 27,411 CY. Approximately 1,568 CY of soil will be removed during culvert construction. The majority of this soil will be returned to the channel area during final reclamation and will not be used in other areas unless excess material is available (Appendix 2-6). Soil will be placed in accordance with the methods described in Chapter 5 of this M&RP.

Fill that had been imported as part of the pad and culvert construction activities may be used as backfill against highwall and cutslopes and backfill during portal closure or in depressions to aid in the achievement of AOC. If the imported material is to be used as subsoil, it will be characterized in accordance with the Division's guidelines for topsoil and overburden. This characterization will occur at the time of reclamation.

The topsoil/growth medium salvaged at the Pace Canyon fan portal site will be characterized in accordance with the Division's guidelines for topsoil and overburden. This characterization will occur once topsoil has been salvaged.

233.300 Physical and Chemical Analyses

Physical and chemical analyses of the soil material will be conducted while generating substitute topsoil. Samples of the soils will be obtained after physical segregation has occurred. The rate of sampling will be one sample per every 500 CY (approximate) of material generated. Additional samples maybe obtained if the quality of the soils generated is questionable. This material will be analyzed for the following parameters. Reference Section 233.200 for Pace Canyon information.

pH
Electrical Conductivity (EC)
Saturation Percent
Calcium (soluble)
Magnesium (soluble)
Sodium (soluble)
Sodium Absorption Ratio (SAR)
Total Sulfur
Acid/Base Potential
Total Organic Carbon
Phosphate
Nitrogen (nitrate)

Boron

Selenium

Available Sodium

Exchangeable Sodium

Alkalinity

Total Kjeldahl Nitrogen

Water Holding Capacity

Percent Coarse Fragment, Sand, Silt, and Clay

The applicant will utilize the substitute topsoil for reclamation purposes only subsequent to approval by the Division.

Certification of Reclamation Topsoil Suitability. The suitability of the substitute topsoil will be certified by an approved laboratory in accordance with at least one of the following: Soil Conservation Service published data and technical guides, state agricultural agency, Tennessee Valley Authority, BLM - USFS published data, physical and chemical analyses results, field-site trials, or greenhouse tests.

233.400 Testing of Substitute Topsoil

Only the substitute topsoil used in lieu of, or in conjunction with, on-site overburden and topsoil will be tested as described in Section 233.300. Hereafter, references to topsoil will include substitute topsoil unless noted otherwise.

234 Topsoil Storage

234.100 Topsoil Stockpiling

Topsoil removed will be stockpiled for later use in reclamation operations when it is impractical to promptly redistribute the topsoil on regraded areas.

234.200 Stockpiled Topsoil

Stable Stockpile Site. Stockpiled materials will be placed on a stable site as described in Section 231.400.

Protection from Contaminants and Compaction. Stockpiled topsoil/growth media will be protected from contaminants and unnecessary compaction. To protect the topsoil/growth media from contaminants and unnecessary compaction that could interfere with vegetation, the stockpiles will be isolated ~~with no means of access from the main surface area~~ (Section 231.400). A topsoil storage sign will be installed at ~~the base of~~ the stockpiles.

Soils removed from the Dugout Canyon Mine will be stockpiled in the Soldier Canyon Mine topsoil stockpiles. The Dugout Canyon Mine soil stockpiles will be constructed in such a manner as to allow equipment access to the existing Soldier Canyon Mine soil stockpiles without causing disturbance to the Dugout Canyon Mine soils. Specifically, the piles will be separated by a distance great enough for equipment to access any stockpile. Furthermore, a continuous berm will be constructed around the stockpile to further separate the soils from the two mines. The berm will be constructed as specified in Appendix 7-9.

Cheat grass has apparently invaded much of the area adjacent to the designated Dugout Canyon Mine stockpile area. The operator will endeavor to maintain, to the extent possible, the stockpile's interim vegetation in a noxious weed- and cheatgrass-free state. Measures that can be taken to ensure this include treating areas with a commercially available selective herbicide that targets

undesirable weeds and/or grasses. If infestations of undesirable vegetation are extensive, treatment of the infested areas with nonselective systemic herbicides may be necessary. If the later case occurs, the areas treated will be reseeded with the appropriate interim seed mix designated for the stockpile and/or adjacent disturbed area. Additionally, application of pre-emergent herbicides may be necessary to control cheatgrass and/or noxious weeds. Since pre-emergent herbicides can stop the germination of desirable vegetation, reapplication of these species may be necessary. The proper treatment method of the infested areas will be discussed with the Division prior to implementation.

Wind and Water Erosion Protection. All stockpiles will be protected from wind and water erosion by prompt establishment and maintenance of a vegetative cover. Berms will be constructed around the stockpile to help trap sediment runoff from the stockpiles.

The Pace Canyon fan portal site topsoil stockpile will have a full containment berm around it capable of holding the 10-year, 24-hour storm event. The design of this full containment berm can be found at the end of the calculations in Appendix 7-12.

Topsoil Redistribution. All stockpiled soil will not be moved until redistributed during reclamation operations unless approved by the Division.

234.300 Topsoil Stockpile Relocation

Stockpiled soil in jeopardy of being detrimentally affected in terms of its quantity and quality by mine operations may be temporarily redistributed upon approval by the Division and modification of this M&RP.

Host Site. Soil relocation may occur provided that such action does not permanently adversely affect topsoil of the host site.

Topsoil Suitability. Stockpiled soil relocation may occur provided the material is retained in a condition more suitable for redistribution than if stockpiled.

240 RECLAMATION PLAN

241 General Requirements

Topsoil redistribution, amendments, and stabilization are discussed in Sections 242, 243, and 244, respectively.

242 Soil Redistribution

242.100 Soil Redistribution Practices

Within the disturbed area, any contaminated surface soil will be removed and stored during the final reclamation process. If the contaminated soils can not be rehabilitated, the material will be buried along with ~~excess gravels, crushed stone, or~~ other contaminants. All backfill placed prior to topsoil and substitute topsoil spreading will be ripped or loosened by the methods described in this section and in Section 341.200 of this M&RP.

Soil previously removed from the Dugout Creek channel walls during culvert construction will be returned to the channel area during final reclamation, to the extent possible. If after construction and resoiling of the channel area an excess of "channel" soil exists, it will be appropriately distributed within the disturbed area to increase topsoil thicknesses.

Soil Thickness. The Dugout Canyon topsoil will be distributed to the disturbed areas illustrated on Plate 5-5. Topsoil will not be distributed on the primary road or the floor of the stream channel. During reclamation, the topsoil will be allowed to settle and attain equilibrium with its natural environment. This procedure will be followed for all areas in which facilities such as ancillary road beds, mine pads, and building sites are to be abandoned.

Based on the results of the sampling and analysis of soil test pits TP-1, 4, 5, 6, 7, 8, and 9 and the description of pits 14 and 14A, approximately 27,411 CY of topsoil/growth media will be available to be distributed on reclaimed surfaces within the disturbed area boundary (Appendix 2-6). An estimated 14.7 acres within the disturbed area will receive topsoil. Based on the estimated quantity of available topsoil and the area to be covered, approximately 13.8 inches of topsoil will be placed in the reclaimed areas.

The Pace Canyon topsoil will be distributed to the disturbed areas illustrated on Plate PC5-5. Topsoil will not be distributed on the realigned road segment.

Compaction. To prevent compaction of topsoil, soil moving equipment will refrain from unnecessary operation over spread topsoil. Front-end-loaders and other wheel mounted equipment may be used to transport and dump topsoil. However, to minimize compaction, only track-mounted equipment (e.g. bulldozers, trackhoes) will be used to spread the topsoil. The topsoil will be loosened prior to seeding as described in Section 341.200 of this M&RP.

Erosion. Care will be exercised to ensure the stability of topsoil on graded slopes to guard against erosion during and after topsoil application. Erosion control measures may include but not be limited to surface roughing and deep gouging.

242.200 Regrading

Since the Dugout Canyon mine area has been disturbed by previous mining activities, there are no private or public topographic maps which can be used to accurately determine the original geometric configuration of the canyon. Prior to topsoil redistribution, the disturbed area in Dugout and Pace Canyon will be regraded to agree with final reclamation topography (Chapter 5).

~~Where possible, regraded land will be scarified by a ripper-equipped tractor or other appropriate equipment.~~ The surface will be ripped to between 6 and 24 inches where possible to reduce

surface compaction, provide a roughened surface to assure topsoil adherence, and promote root penetration.

On slopes too steep to accommodate contour ripping with a tractor or other appropriate equipment, the surface will be roughened to between 6 and 24 inches with the teeth of a trackhoe bucket.

In the area of Dugout Creek, the soils removed during culvert construction will be returned and placed along the slopes of the reclamation channel. Where dictated by the design of the reclamation channel, the soils will be placed within the interstitial spaces of the riprap to promote the establishment of riparian vegetation. The soils placed outside the riprap portion of the channel area will be reseeded with the appropriate seed mix following soil preparation and roughening.

242.300 Topsoil Redistribution on Impoundments and Roads

The sedimentation pond and embankment will be dismantled and reclaimed with the other surface disturbed areas. Similarly, reclamation of abandoned roads will also follow the same technique as for other disturbed areas, except as noted.

243 Soil Nutrients and Amendments

Soil nutrients and amendments will be applied to the redistributed soil as necessary, to establish the vegetative cover. The type and rate of application will be determined just prior to final reclamation activities based on analyses of samples collected from the stockpiled topsoils and substitute topsoils. The soils will at a minimum, be tested for pH, EC, total carbon, SAR, potassium, nitrate-nitrogen, and water holding capacity.

244 Soil Stabilization

244.100 Protection and Stabilization of Surface Areas

All reclaimed areas will be stabilized to control erosion by application of mulch, surface gouging, ~~contour furrowing,~~ or other appropriate methods. Rills and gullies will be regarded. Reseeding will be accomplished using BTCA methods suitable for steep slope reclamation. Additional and more detailed discussions regarding topsoil protection during and after final reclamation can be found in Chapter 5. Methods of Revegetation to be employed at final reclamation at this site are discussed in more detail in Chapter 3.

244.200 Mulch Application

Mulch will be applied to all areas that have been regraded and covered with soil to stabilize the topsoil. For further discussion of Revegetation practices to be utilized, see Chapter 3 of this M&RP.

244.300 Rills and Gullies

Postmining Land Use and Revegetation. Rills and gullies that disrupt the postmining land use or reestablishment of vegetative cover will be regraded, the topsoil replaced, and reseeded.

Water Quality. Rills and gullies that contribute to the degradation of stream quality will be regraded, receive new topsoil, and be revegetated.

250 PERFORMANCE STANDARDS

251 Topsoil, Subsoil, and Topsoil Supplements Management

All topsoil, subsoil, and topsoil supplements shall be managed as outlined in Sections 230 and 240.

252 Stockpiled Topsoil and Subsoil

All stockpiled topsoil and subsoil will be managed according to plans outlined in Sections 230 and 240.

REFERENCES:

Jensen, E. H., and Borchert, J. W., 1988. Soil Survey of Carbon Area, Utah. Soil Conservation Service, United States Department of Agriculture, Washington D.C.

Johnson, Wm. M., 1975, Soil Taxonomy, A Basic System of Soil Classification For Making and Interpreting Soil Surveys, Supt. of Doc. S.C.S., Washington, D.C.

Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

APPENDIX 2-1

Prime Farmland Determination Documents

ADD TO THE BACK OF EXISTING INFORMATION

NRCS Natural Resources Conservation Service

NRCS *Utah*

United States Department of Agriculture

Natural Resources Conservation Service

Price Office
350 North 400 East
Price, Utah
84501

Phone:
435 637-0041

FAX
435 637-3146

December 3, 2004

Ms Vicky Miller
Dugout Canyon Mine
P.O. Box 1029
Wellington, Utah 84542

DEC 10 2004

RE: Soils (prime farmland) for Proposed Degas Well G-7, and surface facilities within Pace Canyon (T 13S., R13E., Sec 30 N1/2 of the NW1/4).

Dear Ms. Miller

After a site visit the Natural Resources Conservation Service has determined that there are no prime farmlands in the site area because the soils contain more than 10 percent surface rock fragments or the site has already been converted to non agricultural purposes or the percent slope x K (erodibility factor) exceeds 2.

If you need any further assistance please let us know.

Leland Sasser

Leland Sasser NRCS Soil Scientist

Cc: Michael J. Domeier State Soil Scientist

APPENDIX 2-3

Soil Test Pit Logs

ADD TO THE BACK OF EXISTING INFORMATION

Soil Inventory and Assessment
Pace Canyon Ventilation Fan Project
Dugout Canyon Mine
Carbon County, Utah

November 5, 2004

By:

Dan Larsen
Soil Scientist
EIS Engineering and Consulting
31 North Main Street
Helper, Utah

Soil Inventory and Assessment
Pace Canyon Ventilation Fan Project
Dugout Canyon Mine

On November 5, 2004 an onsite soil inventory and assessment was conducted at the proposed ventilation fan site in Pace Canyon by Dan Larsen, Soil Scientist, Environmental Industrial Services, Helper, Utah. The primary objective was to identify the quality and extent of suitable "topsoil" materials to salvage for reclamation. This supplements information available in "The Soil Survey of the Carbon County Area, Utah and information collected in 2003 for an environmental assessment of several exploration drill sites in the vicinity.

The project is located northeast of Wellington, Utah in a southward bound drainage in the Book Cliffs north of Clarks Valley (N1/2, NW1/4, S30, T13S, R13E, SLBM). It is located near the canyon bottom and toeslopes of a steep, rocky canyon dominated by sandstone rock structure. Rock ledges and large boulders are common upslope from the site. The general vegetation on the site includes pinyon pine, juniper, mountain maple and Douglas fir.

The approximate area designated for disturbance from this project is about 2.7 acres. However, much of the area is presently in a disturbed condition from previous mining activities, logging and the Pace Canyon road.

Soil parent materials consist of colluvial and alluvial deposits derived mostly from sandstone and shale with inclusions of coal. Stones, cobble and gravel fragments composed of sandstone are common on the surface and within the soil matrix. The soils range from shallow along the rock outcrops on the west side to very deep near the present road and between the road and the stream. Much of the soil material east of the road consists of cobbly fill. Soil textures are sandy loam and loam. They are neutral to slightly alkaline in reaction. Representative natural surface soils are very dark grayish brown to brown and subsoils are dark yellowish brown to yellowish brown.

A coal waste pile up to about 40 inches deep covers a portion about 30 feet in diameter near the fan location. The material consists of fairly coarse coal, much of which is about one to three inches in diameter and is unsuited as soil material for plant growth.

Soil that is considered suitable for salvage and surface application is very dark grayish brown to dark yellowish brown in color and has a sandy loam to loam texture with less than 35 percent rock fragments. Material that is very stony and generally yellowish brown in color is considered subsoil material. Although the surface may appear high in rock fragments, there is a considerable amount of soil available that is relatively low in rock fragments. The larger stones

(roughly greater than 24 inches in diameter) and boulders should be separated from topsoil material and not included in the topsoil pile. Waste coal that can be readily identified and removed as a layer should be segregated from the topsoil.

The fill material along the east side of the road consists mostly of cobbly to stony sandy loam subsoil materials. The southern portion appears to have more dark colored topsoil intermingled in it and contains some salvageable soil. Within the narrow, relatively undisturbed strip between the fill and the stream, a very dark colored topsoil is present and is at least 12 inches thick.

The site has soils that are representative of this area and there is no evidence of any unusual properties that would cause any problems for reclamation. Overall, there is an adequate amount of soil suitable as topsoil material. An average of about 12 to 14 inches is projected. Some spots have up to 36 inches of suitable soil, while the roadway and the northeast corner of fill material do not have soils considered as suitable for a surface layer.

The soils are moderately erodible but are susceptible to concentrated runoff from the steep canyon slopes under intense rainfall events. Therefore, adequate runoff control measures must be implemented.

The project area is included in "The Soil Survey of the Carbon County Area, Utah", 1988 by the Soil Conservation Service, (now the Natural Resources Conservation Service). The site is mapped as being within soil map unit 96 (Rock Outcrop – Rubble and Travessilla Complex) and adjacent to soil map units 21 (Croyden loam, 8 to 30 percent slopes), 84 (Podo – Rock Outcrop Complex) and 97 (Rottulee family, Traq complex). In a canyon bottom situation the soils are often transitional to these mapped on either side of the canyon in a general soil survey (order 3 intensity level). The Pace Canyon ventilation fan site appears to be mostly in a frigid soil temperature regime while the northwest canyon slopes are cryic (colder) and the southeast facing slopes are mesic (warmer).

Brief soils descriptions were taken at seven points on November 5, 2004 to identify the characteristics of soils at the proposed fan site.

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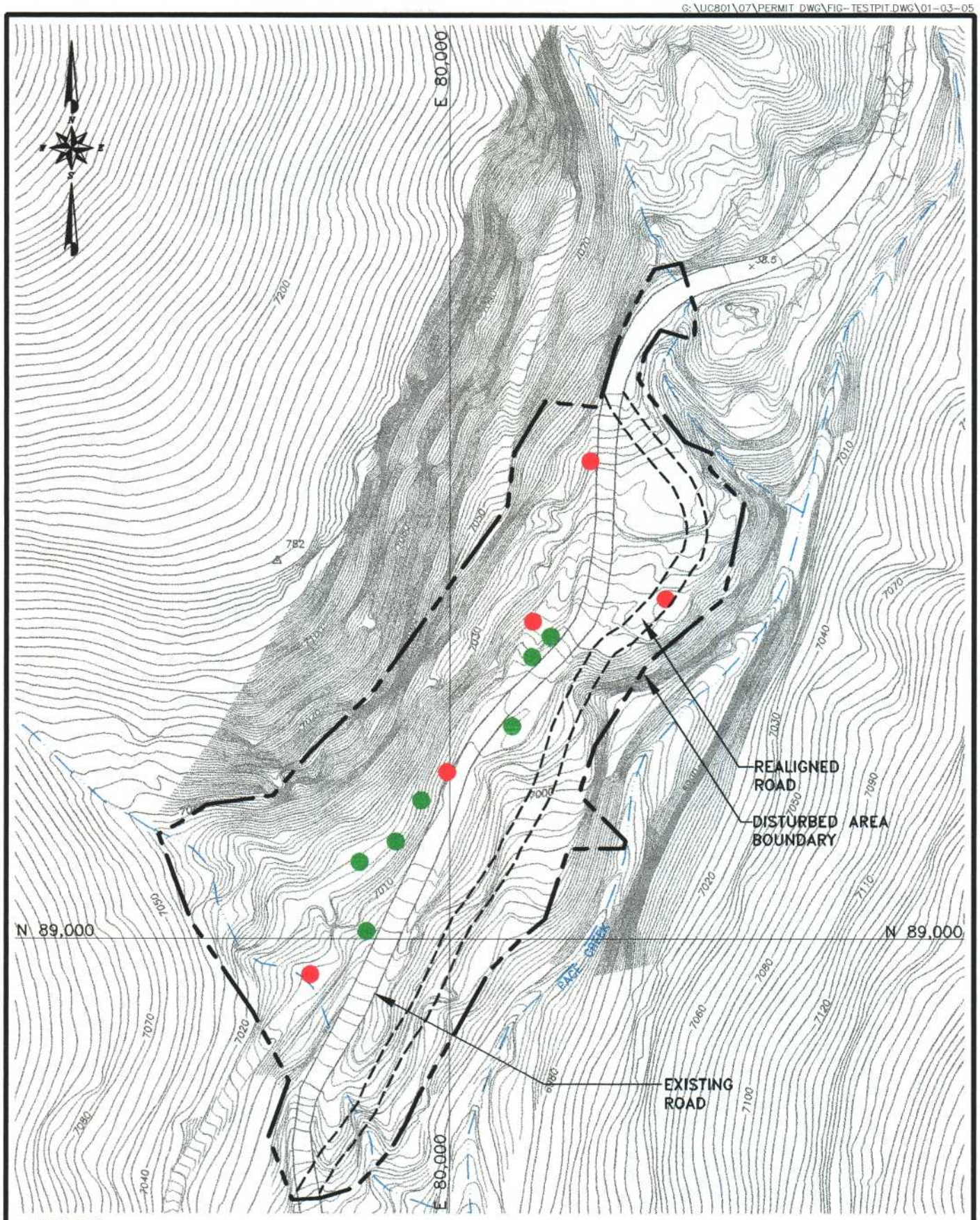

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- SOIL TEST PIT LOCATIONS 2003
- SOIL TEST PIT LOCATIONS 2004

0' 100'

SOIL TEST PIT LOCATION MAP

EarthFax

PHOTOGRAPH LOCATIONS

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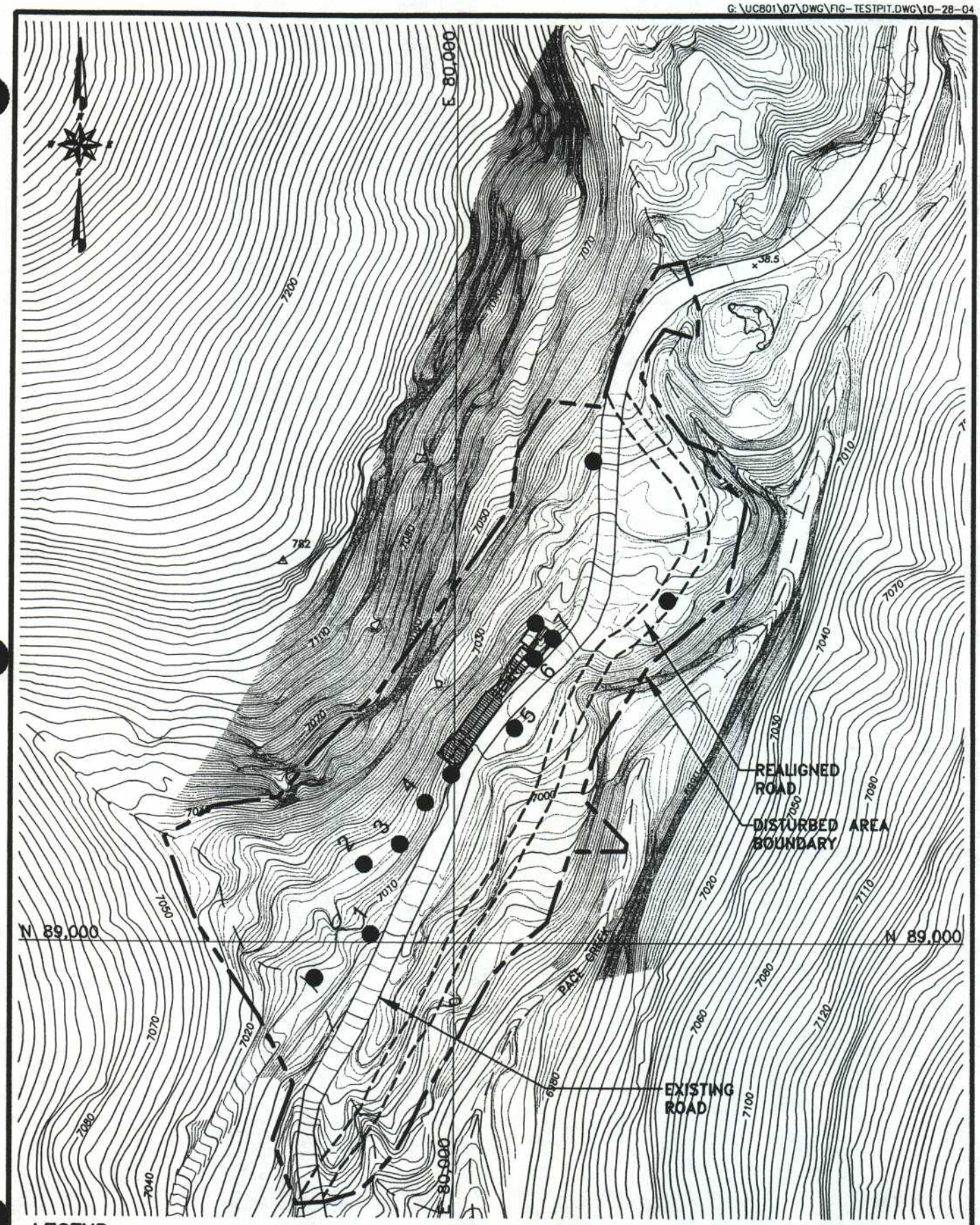

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- SOIL TEST PIT LOCATIONS 2004

0' 100'

PHOTOGRAPH LOCATIONS

SOIL TEST PIT LOCATION MAP

EarthFax

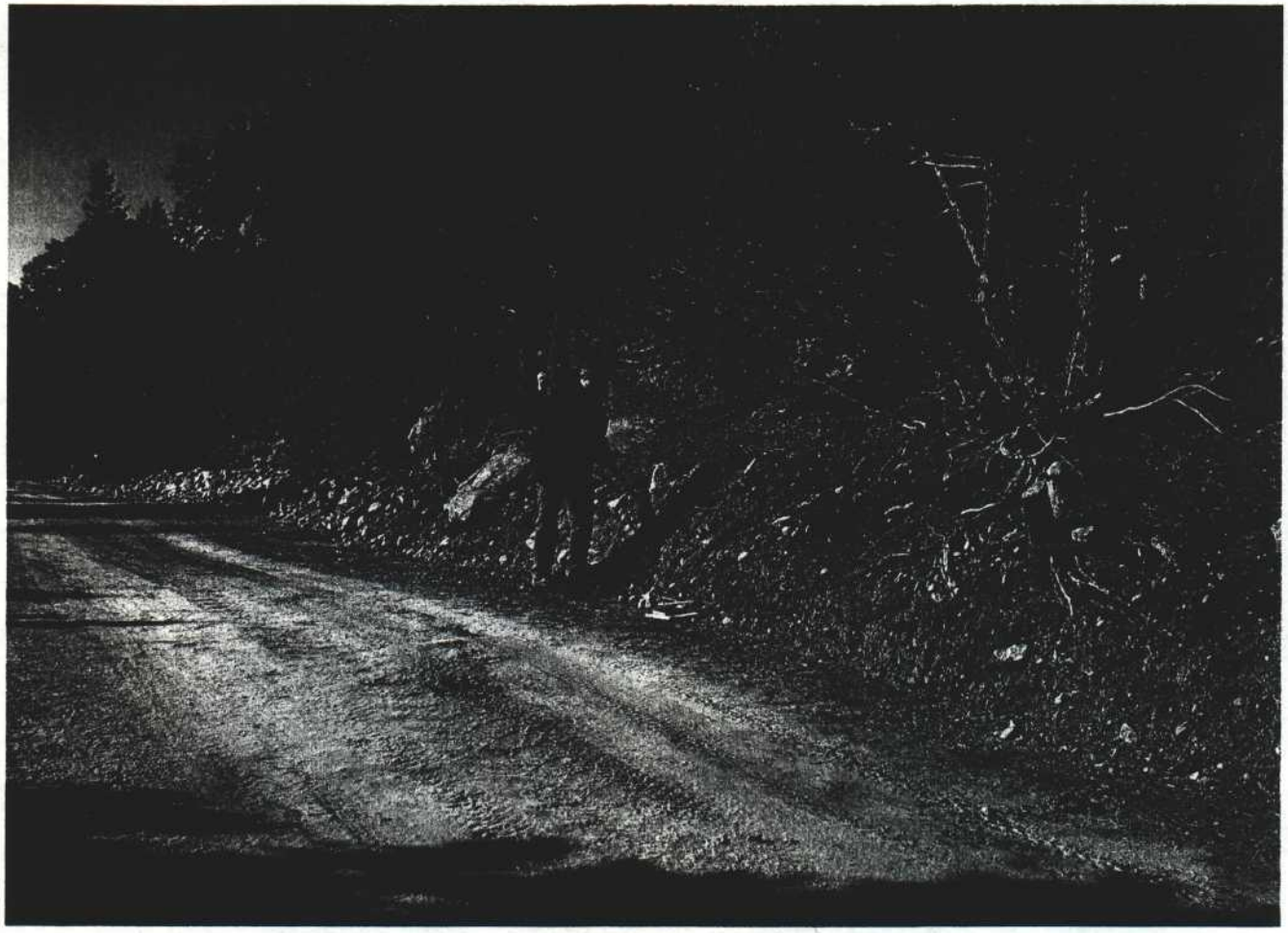

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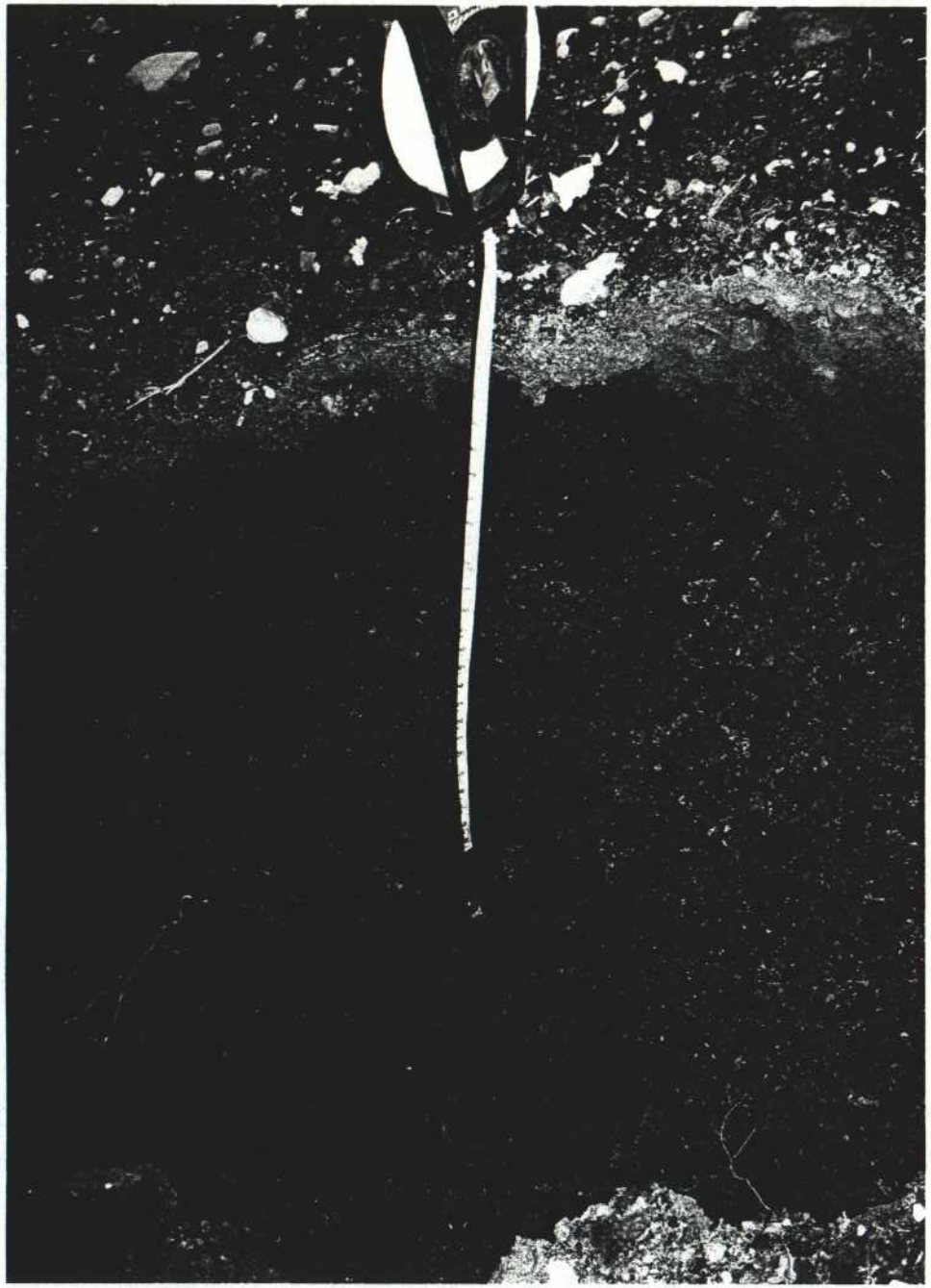
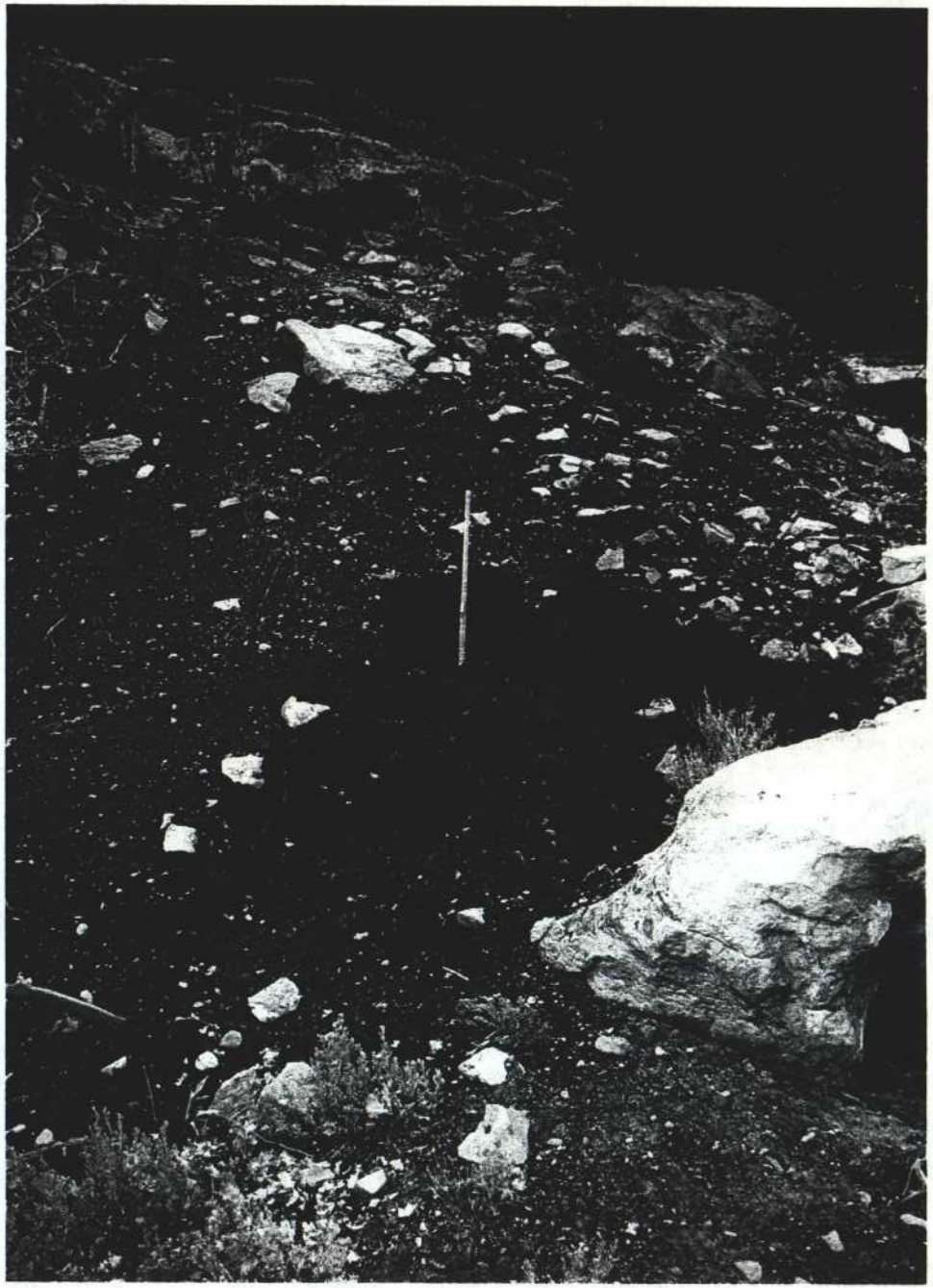
PHOTO #2

PHOTO #3





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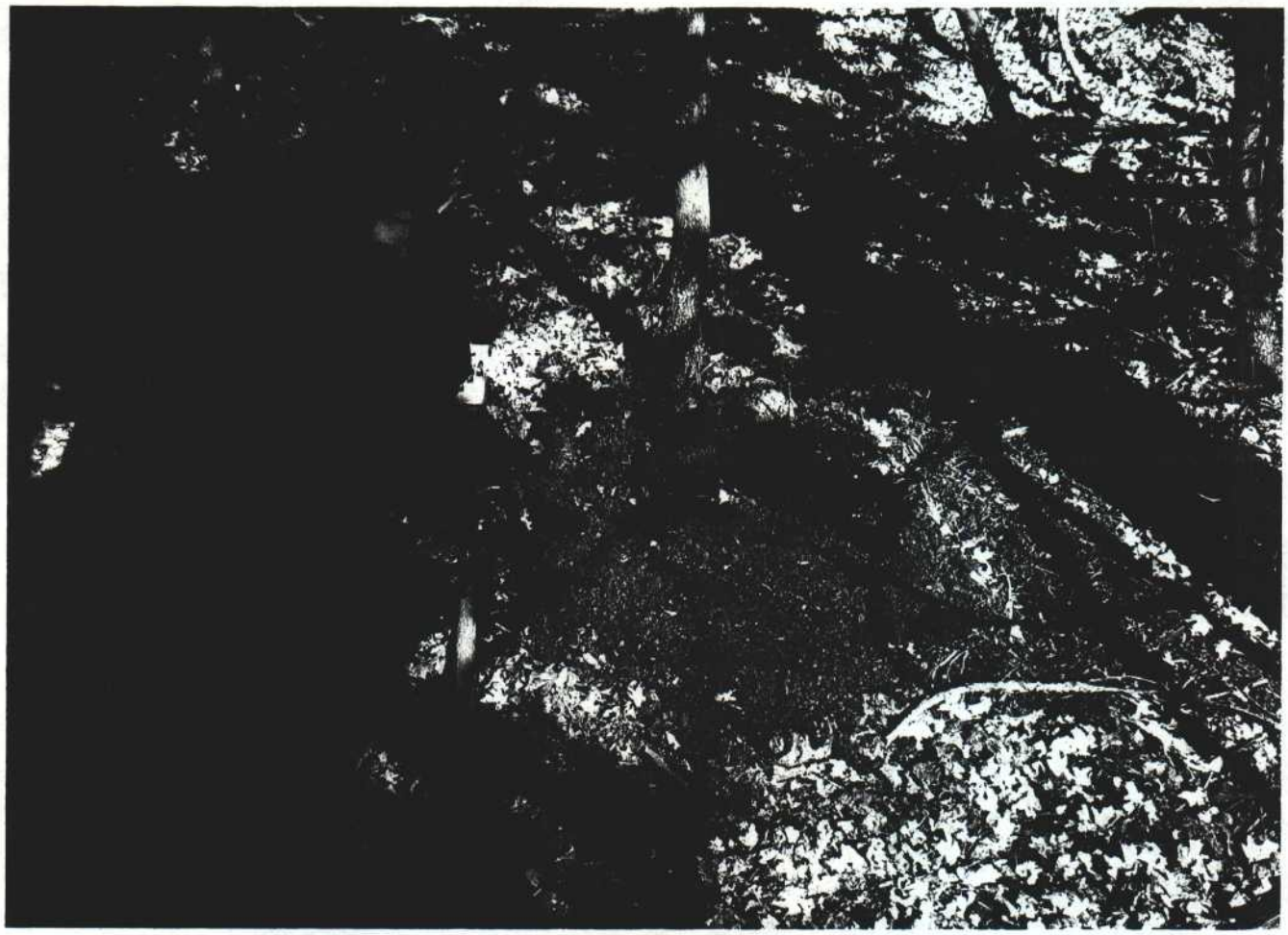

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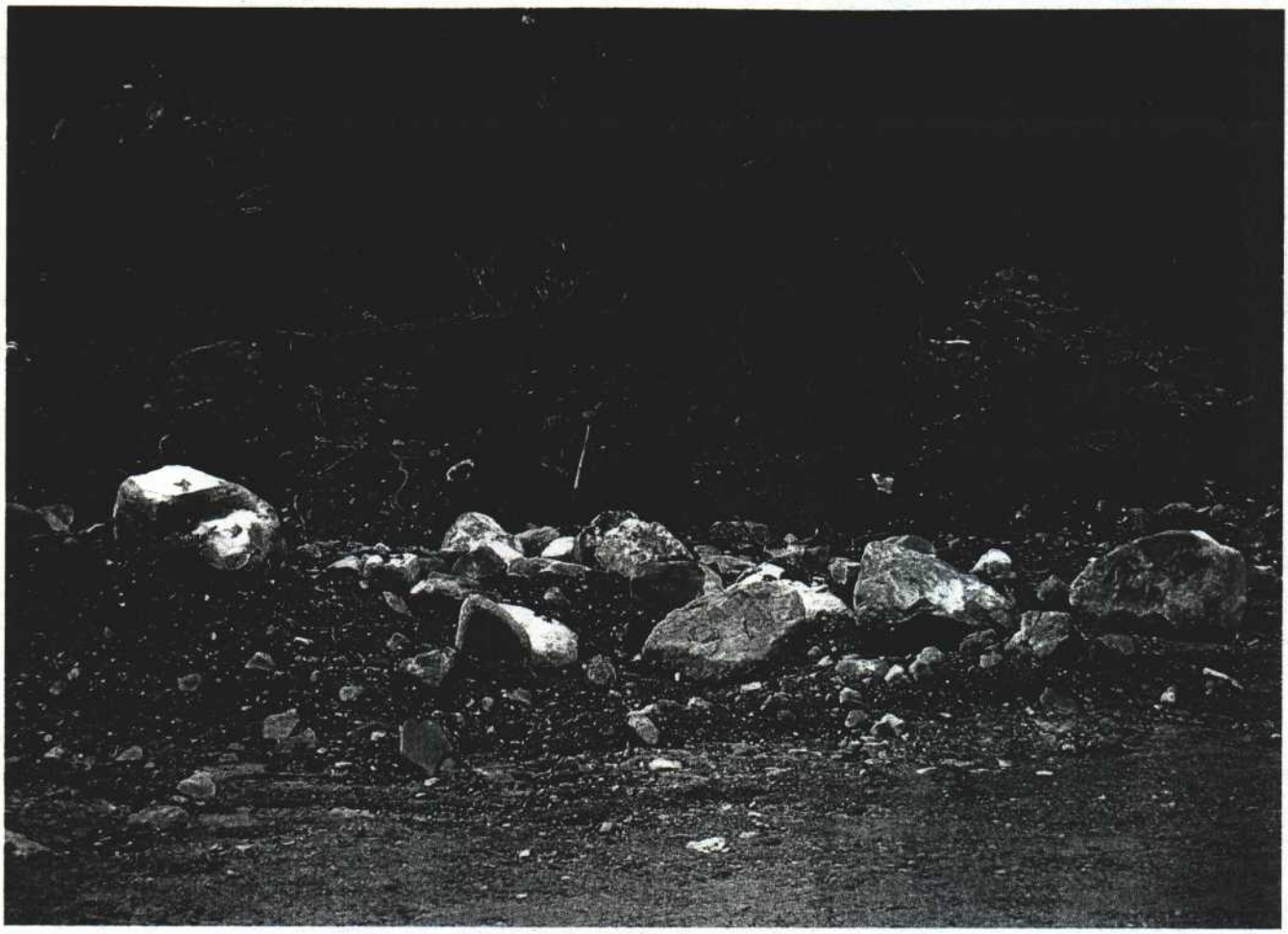

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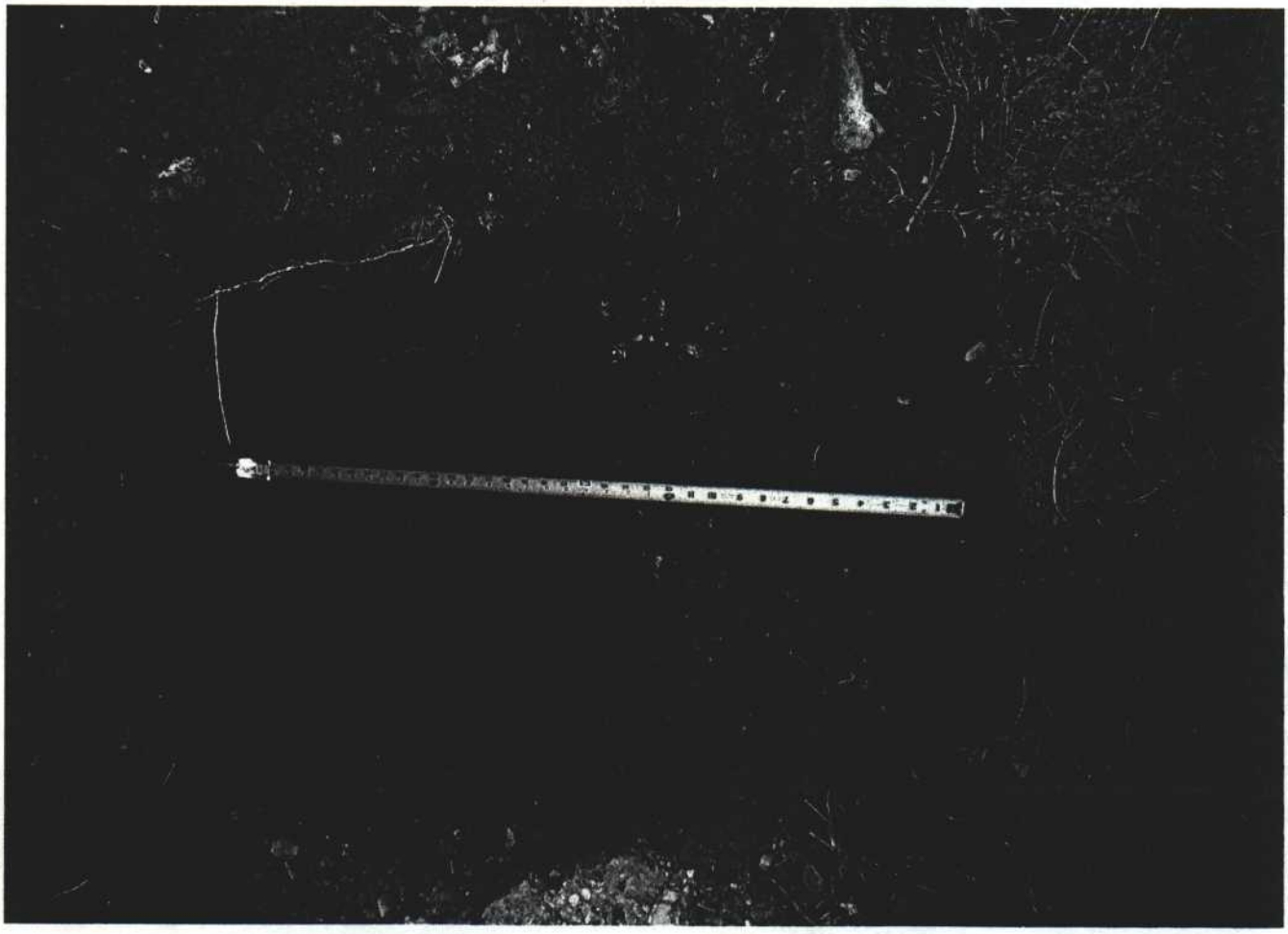

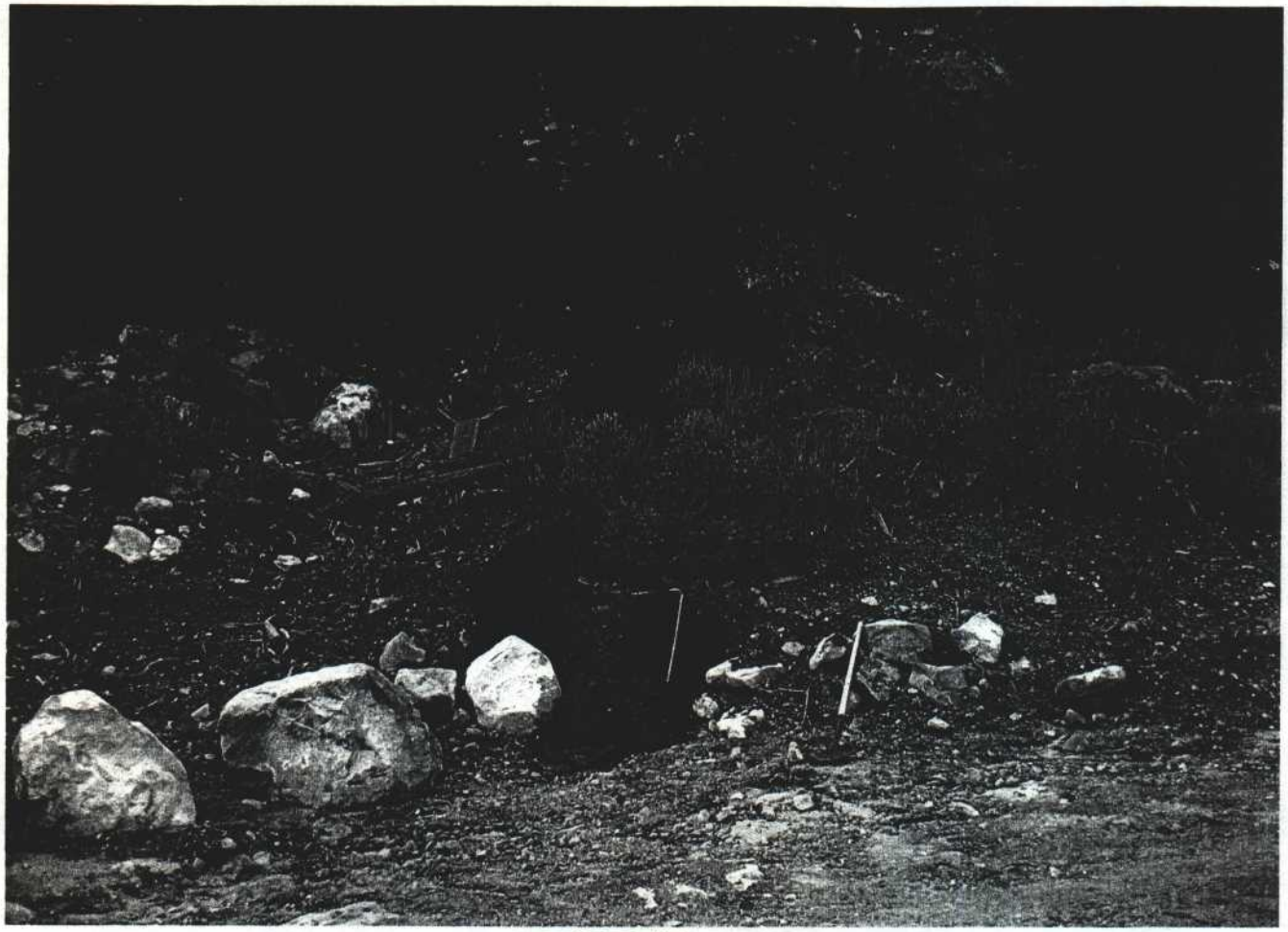

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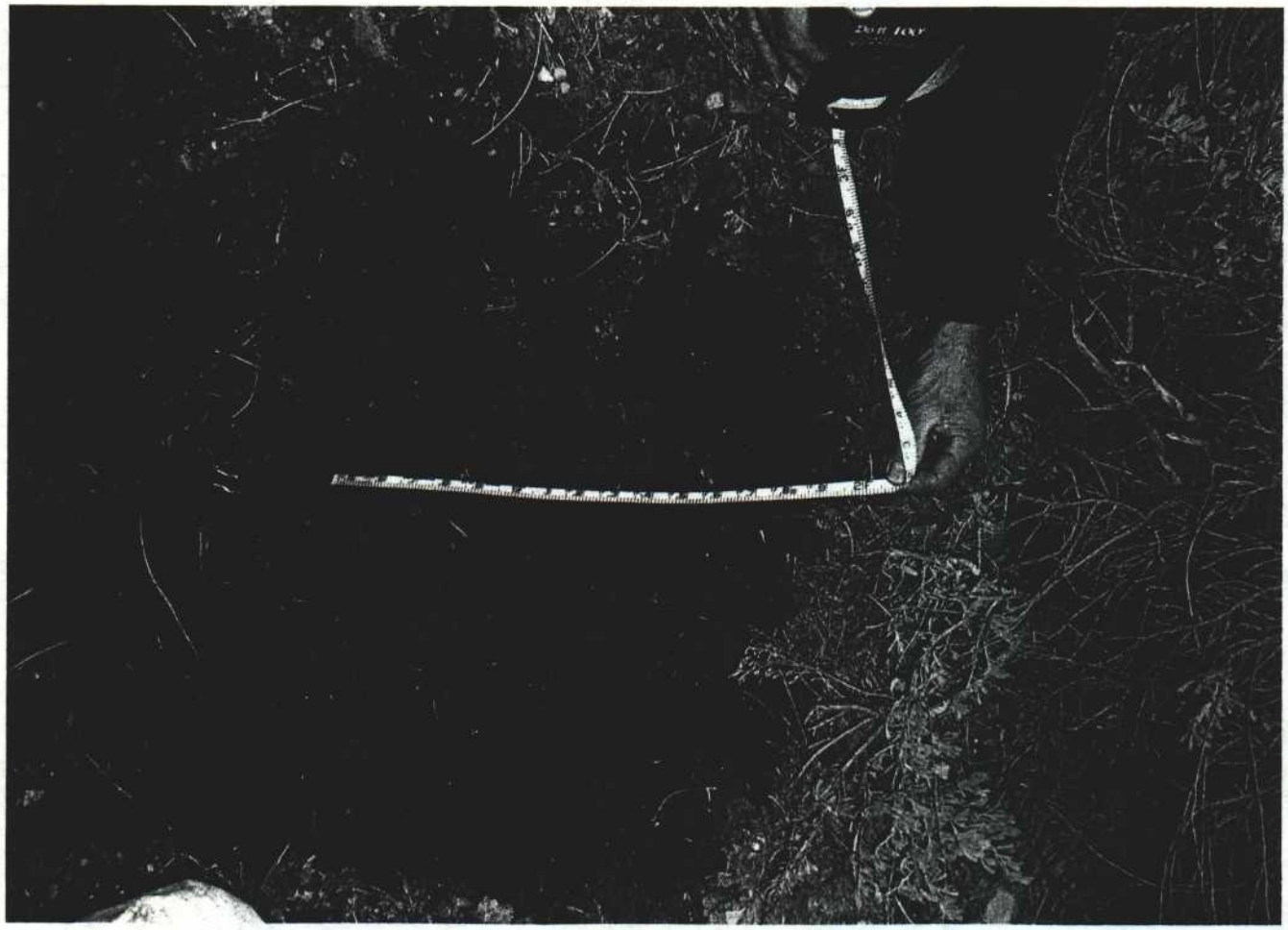

APPENDIX 2-9

Pace Canyon Fan Facilities
Topsoil and Storage Pile Calculations

Topsoil Calculations

General

- The outslopes of the topsoil stockpile and berms are assumed to be 1:1. The angle of repose for soils in this area are in excess of 50°. Thus, the assumption is valid. Topsoil stockpiles for the Degas holes have successfully been built using 1:1 slopes.

- This site has been previously disturbed. Thus, topsoil resources are limited. One foot of topsoil will be stripped and stockpiled from areas impacted by construction with the exception of the current road area and areas only temporarily disturbed. Such as the area impacted by portal construction. (See Plate PC7-5A)

- Berms will be constructed of subsoil not topsoil.

- Topsoil stripped from temporarily disturbed areas will be stockpiled separately. This topsoil will be protected with silt fences until it is replaced, mulched, gouged and reseeded. These areas include the area above the portal and channel diversion area.

- The topsoil stockpile will be designed to hold more than the projected volume to insure proper storage if additional topsoil is found.

Ave. topsoil depth = 12"

Area to be stripped of topsoil = 51,300 ft^2

Volume of topsoil = $(51{,}300\ ft^2)(1\ ft) = 51{,}300\ ft^3$ = 1900 CY

The Average End Area method will be used to estimate the volume in the topsoil stockpile. The areas used in the calculation were generated in AutoCad using 1 foot contours

Elevation (ft)	Area (ft^2)	volume (ft^3)
7024	0	
7025	116	58
7026	433	275
7027	1202	818
7028	—	3117
7029	1915	2020
7030	2124	2220
7031	2316	2383
7032	2450	2584
7033	2718	2812
7034	2906	3039
7035	3172	15367
7040	2975	14825
7045	2955	5759
7047	2804	
		55,277 ft^3 ⇒ 2047 CY

2047 CY > 1900 CY ∴ OK

CHAPTER 3

BIOLOGY

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3-3 Potential Locations of Cliff Escarpments Within Permit Boundary and Adjacent Area

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CHAPTER 3
BIOLOGY

310 INTRODUCTION

This chapter presents a description of the biological resources found on the Dugout Canyon permit and adjacent areas. Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

The data used in preparation of this chapter have been gathered from the Sage Point-Dugout Canyon Mining and Reclamation Plan, Soldier Creek Coal Company Mining and Reclamation Plan, Environmental Research and Technology, Inc., Utah Division of Wildlife Resource (UDWR), Utah State Fish and Game, Eureka Energy Company (Nicolas Temnikov and Christopher A. Slaboszewicz), Soil Survey of Carbon Area, Utah, aerial photography, and Natural Gas Corporation of California.

311 Vegetative, Fish and Wildlife Resources

Vegetative, fish, and wildlife resource conditions in and adjacent to the proposed Dugout Canyon Mine are discussed in Section 320.

312 Potential Impact to Vegetative, Fish and Wildlife Resources

Potential impacts to vegetative, fish, and wildlife resources and the associated mitigation plan are presented in Sections 330 and 340 of this chapter.

313 Description of Reclamation Plan

The reclamation plan used to restore the vegetative, fish and wildlife resources to a condition suitable for the postmining land use is presented in Section 340.

320 ENVIRONMENTAL DESCRIPTION

321 Vegetation Information

This section contains the environmental descriptions of the vegetation for the permit and adjacent areas.

321.100 Plant Communities Within the Proposed Permit Area

Vegetation communities of the permit area were first investigated by Dr. Steven Richardson of Logan, Utah during 1979. These studies encompassed the 22,506 acres of the formerly proposed Sage Point - Dugout Canyon permit area. Dr. Richardson's studies were subsequently upgraded in 1980 by Mr. Steven R. Viert and presented in the Sage Point - Dugout Canyon permit application submitted December 8, 1980 and approved by the Division in May, 1984 (Permit No. ACT/007/009). The vegetation designations used on Plate 3-1 are a combination of their studies, aerial photography, in association with the Soil Survey of Carbon Area, Utah and field verification.

Plate 3-1 has been prepared using the following vegetation designations:

Barren Ground	(B)
Douglas Fir	(DF)
Deciduous Streambank	(DS)
Farmland-Weeds	(FW)
Greasewood-Sagebrush	(GS)
High Shrubs	(HS)
Mixed Conifer	(MC)
Mixed Conifer-Mountain Brush	(MCMB)

Pinyon-Juniper	(PJ)
Ponderosa Pine	(PP)
Quaking Aspen	(QA)
Sagebrush	(S)
Shrub-Grass-Juniper	(SGJ)
Deciduous Stream Bank Vegetation and limited riparian vegetation (Pace and Rock Creek)	(DSR)

As discussed in the report prepared by Mt. Nebo Scientific, the Dugout Canyon disturbed area contains riparian, rabbitbrush/yellow sweet clover, and Pinyon/Juniper vegetation designations (see Appendix 3-1).

The dominant vegetation communities occurring in the area are somewhere below the climax stage of succession. Historic livestock grazing practices have caused a decline, or disappearance, of many naturally occurring species and their replacement by others (often noxious weeds). Over several years, this effect has altered the composition of the floral communities of the area.

Other impacts to the vegetation communities of the area have resulted from the previous construction of roads. Roads and trails tend to follow drainages and have thereby impacted the riparian, sagebrush, mountain brush, and coniferous communities. Weeds usually dominate the disturbed road banks. Mining facilities in Dugout Canyon constructed prior to the enactment of SMCRA displaced an additional small amount of native vegetation.

Baseline sampling by Dr. Richardson only occurred on five of the ten communities existing within the permit area. These five communities are Douglas Fir, Mixed Conifer, Pinyon-Juniper, Shrub-Grass-Juniper, and Deciduous Streambank. Quantitative descriptions of floral communities presented in this M&RP are based on the former Sage Point-Dugout Canyon permit document. Appendix 3-1 presents data for the vegetation communities discussed in this section. The adequacy of the sampling effort is indicated in Appendix 3-1.

The farmland-weeds vegetation type resulted from abandoned agricultural activities (due to lack of water) and is significant only from the standpoint that mule deer tend to feed on remaining alfalfa during the spring green-up. It should be noted that none of this community occurs within the permit boundary.

Due to multiple consultants/companies gathering vegetation data, the following table has been provided to clarify the plant communities names used by each.

Sampling Organization	Plant Community			
Natural Resources Conservation Service	Riparian	Pinyon-Utah Juniper	Douglas-fir	Disturbed
Richardson/Viert Study	Deciduous Streambank	Pinyon-Juniper	Mixed Conifer and Douglas fir	N/A
Mt. Nebo Scientific Study	Riparian	Pinyon/Juniper	N/A	Rabbitbrush/ yellow sweet clover
Pat Johnston Study	Riparian	Pinyon/Utah Juniper	N/A	N/A

Douglas Fir

The Douglas Fir community occurs on the north facing slopes at upper elevations in deeper productive soils. Floral and structural composition is that of a forest community consisting primarily of Douglas Fir with a few scattered Ponderosa pine, Rocky Mountain juniper, and quaking aspen trees in the overstory.

Ground cover of the overstory in the Douglas Fir community averages 65.0% and productivity of the trees was not determined. This community exhibits an average of 380.5 trees/ac comprised mainly of Douglas Fir (68.8% of all trees), Ponderosa pine (26.1%), and pinyon pine (4.1%). Examination of average basal diameters of the trees indicates a late-successional and mature community.

Ground cover of the understory is dominated by shrubs (18.4% cover), especially serviceberry, big sagebrush, snowberry, and creeping barberry with 4.2, 3.8, 3.8, and 2.5% cover, respectively. Grasses exhibit a sparse 0.8% cover while forbs only average 1.6% cover. Productivity of this understory totals 35.8 g/m^2 or approximately 320 lb/ac. Shrubs contribute 26.2 g/m^2 while grasses and forbs contribute 2.7 g/m^2 and 6.4 g/m^2, respectively. Creeping barberry, mountain mahogany, big sagebrush, and snowberry shrubs dominate with 7.7, 5.0, 4.9, and 4.9 g/m^2, respectively. The adequacy of the sampling effort is indicated in Appendix 3-1.

Mixed Conifer

The mixed conifer vegetation type is an ecotonal community which occurs on the slopes of mid-elevational canyons that cut into the Book Cliffs. Floral and structural composition is that of a forest community consisting primarily of coniferous tree species in the overstory. These overstory tree species include Douglas Fir, Rocky Mountain maple, pinyon pine, and Utah juniper.

Ground cover of the overstory in the mixed conifer community averages 24.5% with Douglas Fir, Rocky Mountain juniper, and Rocky Mountain maple trees dominating with 10.0, 5.0 and 3.5% cover, respectively. Productivity of the trees was not determined; however, the community exhibits a density of 223.7 trees/ac. Examination of average basal diameters of the trees indicates a mid- to late-successional community with young Douglas Fir trees.

Ground cover of the understory is dominated by shrubs (11.5% cover), especially snowberry and big sagebrush with 4.5 and 3.5% cover, respectively. Grasses contribute another 4.5% cover, especially western wheatgrass (3.0% cover), while forbs exhibit only 2.5% cover. Productivity of this understory totals 38.5 g/m^2 or approximately 345 lbs/ac. Of this total, shrubs contribute 20.2 g/m^2, grasses 4.9 g/m^2, and forbs 13.1 g/m^2 with big sagebrush, Louisiana sagewort, and mountain mahogany dominating (7.7, 5.9, and 3.3 g/m^2, respectively).

Pinyon - Juniper

The pinyon - juniper community is primarily an open woodland of mature pinyon pine and Utah juniper with very sparse understory vegetation. The community occurs mainly on mesa tops and broad alluvial deposits at the foot of the Book Cliffs, as well as on the more southern exposed slopes of the lower canyons. Pinyon - juniper is one of the most important vegetation communities for mule deer during the winter.

Ground cover of the overstory in the pinyon - juniper community averages 20.0% and productivity of the trees was not determined. This community exhibits an average of 291.1 trees/ac comprised entirely of pinyon pine (43.0% of the trees) and Utah juniper (57.0%). Examination of average basal diameters of the trees indicates a near climax mature community.

Ground cover of the sparse understory is dominated by shrubs (5.2% cover), especially by mountain mahogany with 2.5% cover. Cover by grasses was non-existent in the sampled areas and forbs only averaged 3.4% cover with euphorbia (spurge family) the dominant forb with 2.2% of the cover. The productivity of this understory is very light with only 3.3 g/m^2 (30 lbs/ac) of total annual production. Black sagebrush, mountain mahogany, and buckwheat were the dominant plants with 0.7, 0.5, and 0.5 g/m^2, respectively.

The Pinyon-Utah Juniper community within the disturbed area boundary was surveyed during the Fall of 1997 by Patricia Johnston (see Appendix 3-1). During the survey the cover was 65.94%, with the woody species stems per acre being 2,334.4. George Cook of the Natural Resources Conservation Service (NRCS) surveyed the site to determine pre-mining productivity as defined in Item 4, Section IV, Productivity Measurements, UDOGM Vegetation Guidelines, Appendix A, February 1992. Productivity is discussed in Section 321.200.

Deciduous Streambank

The deciduous streambank community occurs only in a narrow band (usually less than 50 ft wide) along portions of Dugout Creek and other narrow valley bottoms with at least intermittent stream flows. This community differs from adjacent vegetation on canyon slopes (usually mixed conifer, Douglas fir, sagebrush, or mountain brush) in that deciduous trees and shrubs are more common on banks of stream channels. Floral and structural composition is that of a forest community consisting primarily of narrowleaf cottonwood, Rocky Mountain maple, and Douglas Fir trees in the overstory.

Total ground cover of the community averages 63.4% with 38.2, 14.6, 2.4, and 0.4% of the cover due to trees, shrubs, grasses, and forbs, respectively. Dominant trees in the overstory include Rocky Mountain maple, narrowleaf cottonwood, Douglas Fir, and water birch with 12.0, 11.3, 6.0, and 5.3% cover, respectively. Productivity of the overstory was not determined. However, the community exhibits an average of 216.1 trees/ac. Examination of average diameters of the trees indicates a mid- to late-successional community with only fair reproduction of the overstory species.

Ground cover of the understory is dominated by shrubs (14.6% cover), especially elderberry, snowberry and Wood's rose with 3.0, 3.0 and 2.7% cover, respectively. Cover by grasses (2.4%) and to a certain degree, forbs (8.2%), is subdued because of past grazing pressure by livestock, but is still a viable component of the community. Productivity is known only for the community as a whole (102.5 g/m^2 or 912 lbs/ac), and despite past grazing pressures, it is still the most productive community in the area.

In Pace Creek and Rock Creek Canyons, heavy grazing and erosion has resulted in sections of the stream banks having little or no deciduous and/or riparian vegetation. The vegetation within these drainages has been identified on Plate 3-1 with the symbol DSR.

Riparian (1997)

During 1997 a study was performed on the riparian community of Dugout Creek by Patricia Johnston. The study covered approximately 2,100 feet of the creek channel. The study included the gathering of data on cover (84.83%) and woody species density (1,624.6 stems per acre) within the disturbed area boundary. George Cook of the Natural Resources Conservation Service surveyed the site to determine productivity and condition (see Section 321.200). Reports from Patricia Johnston and George Cook are included in Appendix 3-1.

The majority of the riparian vegetation and soils within the study area were disturbed during an earlier mining operation with debris evident along much of the length of Dugout Creek. As was common during early mining, the channel was most likely realigned as additional space for facilities was needed.

Shrub - Grass - Juniper

The shrub - grass - juniper vegetation type is another ecotonal community found between the greasewood - sagebrush and pinyon - juniper communities primarily on south and east facing steep rocky slopes along the base of the Book Cliffs. It can occasionally be found on upland benches and flats. This community exhibits a greater abundance of perennial grasses than any other vegetation type found within the area.

The shrub - grass - juniper community exhibits a sparse overstory of pinyon and juniper trees (2.9% ground cover) which at maturity do not obtain the size of the trees in the pinyon - juniper community. Density of these trees only averages 57.3 trees/ac, and productivity of this sparse overstory was not measured.

The understory of this community is dominated by grasses with 9.3% ground cover, while shrubs exhibit 6.4% cover and forbs exhibit a sparse 0.4% cover. Dominant species include creeping wildrye, galleta grass, and black sagebrush with 5.4, 3.2 and 4.6% cover, respectively. Productivity

of this understory totals 59.3 g/m^2 or 528 lbs/ac with contributions by grasses, shrubs, and forbs of 40.9, 17.1, and 1.2 g/m^2, respectively. Dominant plants are the same as indicated for ground cover.

Ponderosa Pine

Quantitative information for the Ponderosa pine community does not exist as it is too limited in areal extent and it has not been, nor will it be, disturbed by mine facilities. The community is present in the high canyons of the Book Cliffs usually in association with Douglas Fir and mixed conifer vegetation types. Ponderosa pine is the predominant species present; however, Douglas Fir, pinyon pine, and Utah juniper occur with less frequency. A thin growth of mountain shrubs as well as grasses and forbs similar to the mixed conifer community is present in the understory.

Quaking Aspen

Quantitative information about the aspen community was not collected due to its limited areal extent within the upland benches of the Book Cliffs; and because it has not been, nor will it be, disturbed by the mining operation. Quaking aspen is the dominant species in the overstory with an occasional Rocky Mountain maple or Gambel's oak being present. The understory is often park like, dominated by grasses and forbs with only a few shrubs present (mainly snowberry).

Sagebrush

The sagebrush community occurs on the dip slope between 7,200 and 9,000 feet in elevation. Quantitative information was not collected for this community as no mining disturbance has occurred in the past nor is expected to occur in the future. This community often intergrades with other communities, making delineation difficult in certain instances. However, big sagebrush (usually the subspecies mountain big sagebrush) is the dominant species in the community, existing in characteristically dense stands. Common species existing in the understory include lupines, wheatgrasses, bluegrasses, and scarlet gilia.

In 1996, the mean total living cover for the mine's disturbed area (Plate 3-1B) and reference area were 36.90% and 47.50% respectively (Mt. Nebo Scientific, August 1, 1996). The area surveyed by Mt. Nebo was disturbed in a previous mining operation, with no indication that reseeding was completed when mining ceased. NRCS range site descriptions/conditions indicate that the area (surveyed by Mt. Nebo) prior to disturbance was most likely Pinyon/Utah juniper - upland very steep shallow loam.

Refer to Appendix 3-1 for the 1996 Mt. Nebo report discussing the vegetation sampling done at the Dugout Canyon Mine site within the proposed disturbed area. The Mt. Nebo report discusses the vegetation cover, composition, density, reference area, and includes photographs of the transects and reference area.

Pace Canyon - Disturbed Pinyon Juniper

On August 13 - 14, 2003, quantitative and qualitative data were taken on the vegetation of the Pace Canyon fan portal area and it's reference area, by Mt. Nebo. The transect placement technique was employed with the goal to adequately sample a representative subset of the site. The mean total living cover of the vegetation for the site was estimated at 52.50%, 44.67% of this total was from the understory and 7.83% was overstory. Pinyon pine and Utah juniper were the most common species in the overstory, big sagebrush was the most common woody species in the understory. The site had a host of forbs, nearly all of which were annual exotics or weedy species (most common was poverty weed). The only grass species inventoried was cheatgrass. The majority of the site has been previously disturbed by various activities, such as road construction, logging, exploration and mining. Refer to Appendix 3-4 for a copy of the Mt. Nebo report.

321.200 Land Productivity Prior to Mining

The land productivity of the area to be disturbed by mining was not measured in 1925 when mining first disturbed the area. Appendix 3-1 contains additional data pertaining to vegetation. George

S. Cook of the NRCS surveyed the condition and production of the range site areas within the disturbed area boundary in 1997, his findings were as follows:

PJ Sage	Condition - Good	Production - 800	Potential Production - 800
Riparian	Condition - Fair	Production - 1500	Potential Production - 2200

The production is based on air dry weight of total herbage produced per acre. Patricia Johnston accompanied Mr. Cook. See Appendix 3-1 for a copy of the December 3, 1997 letter from Mr. Cook.

Pace Canyon - Disturbed PJ

Since the site was previously disturbed, production estimates were provided by Dean Stacy of the NRCS (Natural Resources Conservation Service). A letter and attachments from Mr. Stacy are included in Appendix 3-4. Production estimates for High Mountain Loam with west facing slopes for a normal year with medium cover was 600, eastern facing slope with Upland very steep stony loam was estimated at 550 annual production. Mt. Nebo estimated the total woody species density at the Pace Canyon site to be 444.

322 Fish and Wildlife Information

A summary of the fish and wildlife resource information for the permit and adjacent areas is contained in Sections 322.100 through 322.300. The data pertaining to wildlife in the following sections were collected by the UDWR (J. S. Burruss, L. B. Dalton, Larry J. Wilson, Ben Morris, Bill Bates, etc.), Eureka Energy Company personnel, EIS Environmental and Engineering Consulting and Environmental Research and Technology, Inc.

322.100 Level of Detail

The scope and level of detail within this M&RP are sufficient to design the protection and enhancement plan for wildlife and fish in the area.

This assessment of wildlife resources has been compiled pursuant to guidelines issued by the Division.

322.200 Site-specific Resource Information

Eight permanent experimental and four permanent control wildlife transects were established in the permit and adjacent areas by UDWR in December 1979. Appendix 3-2 contains a figure showing the transect locations. The transects were located within pinyon-juniper, desert shrub, and mixed conifer vegetation communities; and used to monitor wildlife habitats. The wildlife habitats included in the study were small mammals, medium-sized mammals, large mammals, raptors, game birds, song birds, reptiles, and amphibians. The four permanent control transects were located in areas not proposed for disturbance by mining operations. Appendix 3-2 contains the information pertaining to the transect studies.

Macroinvertebrates and Fish

Due to the variable nature of the stream flows in the project area and the limited number of species of macroinvertebrates identified by the UDWR and the Division, further study of aquatic macroinvertebrates was not pursued.

The low importance of the streams, as a fishery resource, has categorized them as being of little value for extensive aquatic study. Therefore, detailed aquatic studies were not performed on Dugout Creek in accordance with permission from the Division in 1979 (see letter from Mary Ann Wright, Appendix 3-3).

Small Mammals

Small mammals represent a significant part of the ecosystem. The majority are herbivores and are the primary source of food for higher trophic levels, particularly raptorial birds, canids, and felids. Small mammals, including shrews, mice, voles, chipmunks, and ground squirrels were sampled with live traplines within each transect. Relative abundance was determined for each species by

transect, but not by habitat type, within the individual transects. Data concerning bats were not collected during this study, however a bat survey of the riparian and disturbed area in Dugout Canyon was performed in 1997 by Mark Perkins and included in Appendix 3-3.

Medium Mammals

The transect study did not attempt to make density estimates due to the extreme ecological variability of these mammals. The study did identify species and frequency of habitat use in the area.

Limited portions of Dugout Canyon provide habitats for weasels, badgers, and skunks. Even though the breeding and rearing activities of these non-migratory species and their dens and burrow systems are important to maintenance of their populations, the area to be disturbed is small and the species are widespread and adapt easily to the activities of man.

Large Mammals

Habitat use by all large mammals, other then mule deer, was determined in a quantitative manner. Plate 3-2 (confidential) exhibits the significant habitat for mule deer and elk in the area. Habitat use in the proximity of the permit area was determined by pellet group count and observation of track frequency. Pellet counts were made in late spring, following movement to summer range. Track counts were made once each month in January through May on all transects.

The area to be disturbed parallels a water source and therefore is important to all wildlife species. The fact that elk and deer utilize some portion of the permit area during the year means that all activities must be considered.

Mule deer on the mine area are considered by the UDWR to be part of Herd Unit 32 and the elk as part of Herd Unit 24. The deer utilize the entire permit area but seasonally concentrate in and utilize specific habitat types. During the summer the mule deer generally utilize all of the habitats near water. The most heavily used communities are the sage, mountain brush-mixed conifer, and

the composite of aspen, mountain mahogany, manzanita, and pine/fir. There is normally more browse in these communities than in the others.

With the onset of fall and winter, the mule deer latitudinally migrate. Initially (late fall and early winter) they concentrate on the plateau area where they intermingle with the elk; but when the snow gets too deep for them to traverse they move into the low elevation sage and pinyon-juniper areas. The wintering areas for mule deer make them susceptible to road strikes in the vicinity of the proposed haul and access road for the Dugout Canyon Mine. The access roads to Pace and Rock Canyon crosses area used by deer as winter range, however traffic is sporadic during the winter months and heavier during the summer and fall months.

Raptors

Golden eagles are a common year long resident of the area, with suitable nesting habitat spread throughout the permit area. The cooper's hawk is known to nest in the permit area.

A variety of falcons are year long residents of the area, utilizing cliffs for their nests. To date there are no known aerie sites for falcons within or immediately adjacent to the disturbed area.

Raptors were studied during the 1979 - 1980 UDWR transect study, in 1981 by Janet Lee Young and by Hayden-Wing Associates in 1984. These reports are provided in Appendix 3-3.

Raptor nest surveys were done by the UDWR in 1995, 1997, 1998, and 1999. The nest locations identified in 1997 and 1998 are shown on Plate 3-2 in the mine's UDOGM confidential folder (confidentiality required by UDWR). All nests located in the 1997 survey were cliff nests (Ben Morris, UDWR, January 20, 1998). All nests located in the 1998 and 1999 surveys were cliff nests.

Raptor nest surveys will be conducted annually in the Spring prior to mining activities or potential subsidence within the permit area and in proposed expansion areas to the permit to obtain base line data.

Migratory and Song Birds

Birds were studied during the 1979 - 1980 UDWR transect study. However, a more extensive study was done by Hayden-Wing Associates in 1984. Their report can be found in Appendix 3-3.

Reptiles and Amphibians

Increasing elevation rapidly reduces the number and kind of reptiles and amphibians. Furthermore, in Utah the effects of the more northern latitude reduces the number of herptiles in much the same way as does the increase in elevation.

These geographical and associated climatic factors have eliminated most desert species, leaving species that are adapted either to mountain habitats or montane type habitats. Based on extensive literature review and limited field work, it was determined that potentially 8 species of amphibians and 18 species of reptiles inhabit the area. Of these species only 5 were recorded by the UDWR in 1980: Eastern fence lizard, Sagebrush lizard, Tree lizard, Short-horned lizard, and the Gopher snake. A WESTECH biologist observed two other species in 1979, the Western whiptail and the Midget faded rattlesnake. All amphibians and reptiles are legally protected, but since the species listed are all widespread throughout the mountains of Utah, none are treated as high-interest species. It is doubtful that the proposed action would seriously impact populations, but localized individuals may be involved in habitat destruction due to subsidence. An exception to this would be if subsidence caused drying of present wet habitats essential to reproduction. Refer to Section 332 for a discussion of "Possible Short-Term and Long Term Impacts to Species Dependent on Springs, Creeks and Drainages".

Pace Canyon

Wildlife indigenous to the general area of the project include amphibians, reptiles, birds and mammals. A copy of the 2004 raptor survey map for the area is included in Appendix 3-3 (moved to confidential folder February 2005). Calling surveys of the area were also done in 2003 and 2004 for the Mexican spotted owl (Appendix 3-3).

Amphibians - There are six common species of amphibians known to occur within the general area (mesic area). These species could be present within the Pace Canyon area, but their occurrence is doubtful due to arid conditions that prevail over the majority of the area. The pinyon/juniper and sagebrush/grass areas that make up most of the affected habitat are not considered important or limiting to their survival (Dalton et al, 1990).

Reptiles - There are ten species of reptiles known to inhabit the region. The limited acreage of disturbance, however, should not be considered a threat to these species, due to the abundance of pinyon and juniper habitat, as well as sagebrush and grass habitat throughout the area.

Birds - There are approximately 185 bird species that could either be potential yearlong residents or frequent the site during portions of the year. Of these, loggerhead shrike (BLM Sensitive species) and raptors are discussed below.

An survey of the fan portal area indicated no nesting loggerhead shrikes, *Lanius ludovicianus*, near the proposed roads. This species is dependent upon the broad, open sagebrush and grass plain, as well as the presence of widely spaced pinyons and junipers. A summary of the inventory conducted for this species and a negative determination of its presence is included in Appendix 3-4 (BLM EA, UT-070-2003-55).

Raptor surveys, completed in May of 2004 by the UDWR, revealed a number of raptor nest sites on the open lower benches and cliff faces in and surrounding Pace Canyon. Two inactive golden eagles *(Aquila chrysaetos)* nests on the outer edge of one mile radius from the fan site were

inventoried in 2004 (Section 24, R12E T13S) and two potential raven nests were located in previous years in Section 23, R12E T13S.

The 2004 spring inventory identified no active and or tended Golden Eagle nests within a 1/4 mile of the proposed site. An inventory in 2002, 2003 and 2004 for Mexican Spotted owl and Goshawk did not reveal the presence of these species within the fan project area.

Mammals - Ninety-two (92) species of mammals have the potential to inhabit the region. Of these, the following species; mule deer, *Odocoileus hemionus*, elk, *Cervus elaphus* and pronghorn antelope, *Antilocapra americana*, have been identified to live within or adjacent to the affected area.

Mule deer habitats within the affected area include high priority winter ranges located on the lower elevation benches below the site, as well as year-long range located on the lower elevation foothills below the Book Cliffs.

Elk high priority winter ranges are found on the higher elevation benches above the fan facilities surface area and lease area. No winter range is located within the area of the surface facilities or roads.

Pronghorn antelope occupy the salt desert shrub habitat of the lower elevation ranges along the Clark Valley Road. This habitat is classified as high priority year-long range for pronghorn.

Threatened and Endangered Plant and Wildlife Species. Passage of the Endangered Species Act of 1973 (Public Law 23-20S) provided the legal basis for establishment of lists of endangered and threatened plant and wildlife species (Appendix 3-3).

Although three species (black-footed ferret, bald eagle, and peregrine falcon) on the list could potentially inhabit the area, an inventory of endangered wildlife species performed in 1979 by the UDWR recorded no threatened and endangered species within the proposed permit area. No confirmed sightings of black-footed ferrets have occurred within Carbon County during 1995, 1996,

and the first quarter of 1997, however bald eagles have been seen flying in the vicinity of the mine (Bill Bates, UDWR).

A literature review and field studies for both the Soldier Canyon and the Sage Point - Dugout Canyon permit documents were performed to assess the possible presence of any threatened, endangered, or sensitive plant and wildlife species in the respective permit and adjacent areas.

These study areas included the proposed Dugout Canyon disturbed area. The literature review indicated that no species listed (or proposed as candidates) by the U.S. Fish and Wildlife Service (FWS) as threatened or endangered were likely to inhabit the area. In addition, the field investigations which occurred in 1979, 1980, 1983, and 1984 did not identify or locate any threatened or endangered species. No threatened or endangered plant species including Canyon sweetvetch were found within the disturbed area by Robert Thompson during his 1995 survey (see Robert Thompson letter, Appendix 3-1). Mr. Thompson is qualified and has performed threatened and endangered surveys for the U.S. Forest Service.

As reported in the 1997 bat survey "we noted no suitable habitat, did not record via detectors or capture, or note by indicators presence of *Corynorhinus townsendii*. It is our opinion the bat does not occur in the immediate vicinity of the proposed disturbance area. We also did not note suitable habitat for or encounter *Euderma maculatum* by mist net, via detectors or during audible bat transects".

Windy Gap Process as it Applies to Existing Coal Mines in the Upper Colorado River Basin

Per meetings with Division of Water Quality personnel during application for a UPDES permit in 2004, "there is no data supporting the premise that surface waters associated with the area of the mine operations reached the Price River or Colorado River prior to or since mining disturbance".

Mining Consumption:
Culinary Water is purchased from PRWID and hauled by D & D Trucking to the Mine.
Estimated **Purchased** Gallons/yr: 1,003,200
Ventilation Consumption/Evaporation:
29,354 gallons/day (3/05/04 ventilation survey)

44,000 gallons/day (9/13/04 ventilation survey)
73,354 X 0.5 = 36,677 gallons/day (survey average)
36,677 x 365 = 13,387,105 gallons/yr

Coal Producing Consumption/Coal Moisture Loss:

Water added to coal produced -	4.03% inherent moisture - source Dugout Geologist
	5.80% run-of-mine moisture - year to date average
	1.77% moisture added to coal by cutting operation
Projected Tonnage 2004	4,245,737 tons
Projected Tonnage 6 year average	4,369,084 tons
Tons water/yr	77,333
Pounds water/yr	154,665,562
Gallons water/yr	18,522,822

Sediment Pond Evaporation:

Mine Site Pond	0.107 acres (surface area)
	18.1 in/yr (high estimate based on HCI Technical Memo, August 22, 2002)
	0.16 ac/ft
	7030 gallons/yr
Refuse Pile Pond	0.41 acres (surface area)
	9 in/yr
	0.31 ac/ft
	5612 gallons/yr (five month period, high estimate)

Spring and Seeps Effects From Subsidence - Not Applicable
Alluvial Aquifer Abstractions into Mines - Not Applicable
Alluvial Well Pumpage - Not Applicable
Deep Aquifer Pumpage - Not Applicable
Postmining Inflow to Workings - Not Applicable
Direct Diversions: - Not Applicable
Dust Suppression - 3,500 gallons per truck load, 3 loads per day, for 30 days = 315,000 gallons plus 3,000 per truck load, 1.25 loads per day, for 45 days = 168,750. Total: 483,750 gallons per year.
Mine Discharge: 6 Month Average 362,118 gpd = 132,172,948 gal/yr

Calculation estimates for water use in 2004 were necessary since we are using 2004 purchases and usage and the year is 2 months short.

Pace Canyon

"In accordance with the United States Fish and Wildlife Service's (USFWS) protocols, and inventory for the presence of threatened, endangered, and sensitive fauna and floral species was conducted on August 13, 14, and September 29, 2003. Loggerhead, shrike, burrowing owl, Northern Goshaw, Despain foot cactus, Wright fishhook cactus and Creutzfeldt crypthantha and neo-tropical migratory birds were the sensitive species of concern within the area. A thorough search of all seven well sites and associated access roads did not reveal the presence of these species (BLM, Environmental Assessment, UT-070-2003-55)." A map of the area inventoried is provided in Appendix 3-4 within the referenced environmental assessment , it should be noted that the area covered by the aforementioned environmental assessment is the same area proposed for the construction of the Pace Canyon fan facilities. In addition a sensitive plant species survey was conducted by Mt. Nebo in August 2003. To initiate the study, appropriate agencies were consulted (e.g. Utah Natural Heritage Program) and other sources were reviewed for potential plant species that are know to be rare, endemic, threatened, endangered or otherwise sensitive in the area of study. The only plant identified was canyon sweetvetch. No rare, endemic, threatened, endangered or otherwise sensitive species were found in the area proposed for disturbance.

Habitats of Unusually High Value. High value habitats in Dugout Canyon include the riparian area and the cliff escarpments. Major portions of established habitat will not be disturbed, but the restricted access by wildlife to the water source within the area of disturbance could displace wildlife. The cliff areas adjacent to the disturbed area could harbor mountain lion, bobcat and bear; and with increased activity and noise they may avoid the area. Elk and deer who may frequent Dugout Canyon will likely avoid the area during the heaviest of activity, but resume their normal patterns once they become accustomed to it.

In a letter dated April 22, 1996 to James W. Carter the director of UDOGM, Robert G. Valentine director of the UDWR makes the following comment "much of the area is classified as critical deer winter range and is heavily used by deer and occasionally by elk and antelope". Use classification drawings of the Dugout Canyon area for large mammals (deer, elk, antelope, etc.) were requested from the UDWR in January of 1996 by SCM. The cover letter dated January 30, 1996 from the UDWR and the drawings are included in Appendix 3-3 for interpretation by UDOGM. SCM has

interpreted and transferred the information (provided by UDWR) to Plate 3-2. The use classifications were extended on Plate 3-2 with the incorporation of Federal Lease U-07064-027821.

A survey for bats was performed by Mark Perkins in September of 1997. A report of this survey is included in Appendix 3-3 with a figure showing the bat survey locations. Future surveys for bats will be done concurrent with raptor surveys within the permit boundary prior to cliff disturbing planned subsidence. Pertinent data gathered in these surveys will be included in this M&RP.

No data or definition was available to determine the criteria for an area to be classified as of "unusually high value" for bats. However, since extensive rock faces, cliffs, and escarpments are present throughout the Book Cliffs Region, the land within the permit boundary is not unusual or unique to the area. The Castlegate Sandstone, Blackhawk, and Price River are the cliff forming formations present in the Dugout Canyon area. Refer to Chapter 6 for descriptions of these formations and Plate 3-3 for their locations.

In the Perkins-Dugout Mine Bat Survey the following statement was made "development plans for the proposed disturbance area contains some mitigation for resident bat species. A proposed runoff pond will likely provide accessible year round water and an associated bio-mass. Presently Dugout Creek is not classified as a perennial stream. In addition, plans include several outdoor flood lights which may act as an attractant for phototropic insects and provide a concentrated and stable food resource for local bat populations. Due to no cliff subsidence and mitigating actions noted above, it is our opinion that excepting the disturbance to and removal of 2,000 ft. of riparian zone, impact (either positive or negative) on local bat populations is minimal".

A bat survey is planned for the Spring of 2005, this survey will cover the cliff areas adjacent to a proposed fan breakout in Pace Canyon. Future surveys for bats will be done concurrent with raptor surveys within the permit boundary prior to mining in areas within cliff areas with the potential to subside. Raptors will be monitored on an annual basis by the permittee and DWR in areas proposed for mining during a given year.

Since water and its corresponding vegetation are important throughout the state of Utah, regulatory agencies have been requiring mitigation for disturbance and eventual replacement from the coal industry. SCM will comply with the requirements of mitigation and eventual replacement of the resources which may be lost or disturbed during this mining operation, refer to Sections 331, 340, 350, and 762.100.

As a mitigation effort SCM replanted 7,500 feet of disturbed riparian streambank above the northern disturbed area boundary with a modified version of Seed Mix No. 1 (mitigation seed mix), to assist in restoring vegetation which has been disturbed by the logging industry.

Mitigation Seed Mix (Hydroseed/Broadcast Quantities)

SPECIES	# pls/acre
Bluebunch wheatgrass	5.0
Intermediate wheatgrass	5.0
Slender wheatgrass	5.0
Smooth brome	5.0
Indian ricegrass	3.0
Blueleaf aster	1.0
Blue flax	1.5
Northern sweetvetch	1.5
Mountain big sagebrush	1.0
TOTAL	28.0

Willows were transplanted along the edges of the stream channel above the mine site disturbed area, with the mitigation seed mix being planted from the east edge of the stream channel to the outside edge of the logging road cut. The area between the edge of the stream channel and road cut varies from 10 to 45 feet as it travels the 7,500 feet planned for replanting. The west side of the channel was not disturbed by logging. For clarification the stream channel changes to the west side of the road upstream from the disturbed area boundary.

Due to the steepness and roughness of the slope the area was hydroseeded. The mitigation seed mix (listed above) was sprayed using hydroseeding equipment over the mitigation area. A second pass of the hydroseeding equipment sprayed the mulch/tackifier on top of the previously sprayed seed mix. Two thousand pounds per acre of the Division approved (Appendix 3-1) wood fiber mulch (Ecofiber, trade name) were used on the mitigation area. The seeding and planting was completed during 1998.

Additional mitigation for disturbance is being done to comply with the requirements of the UDWR. The mitigation included the cutting of grown pinyon and juniper trees to improve the growth of the understory adjacent to the Nine Mile Canyon Road. These mitigation efforts are being coordinated directly with the UDWR.

SCM will plant approximately 4,000 willows including both the mitigation described previously and during final reclamation. A portion of the willows were planted during the spring of 1998 to satisfy the mitigation commitment. Willows were planted wherever the channel afforded sufficient space. The channel above the mine site is covered with rock slides in several stretches of approximately 100 feet each. Additional willows will be planted to complete the commitment, however the numbers being planted may decrease since it was discovered during the Spring planting that the channel affords a limited environment for willows. CFC has discussed this matter with Paul Baker of UDOGM and a commitment made by CFC to continue to keep UDOGM involved in the mitigation process. Paul Baker was contacted in 2001 concerning the progression of the willows planted, photographs were taken and forwarded to Mr. Baker for his review. Survival rate for the willows planted was estimated at 75%.

During a site visit in December of 1997, Bill Bates of the UDWR requested that the riparian mitigation include the installation of habitat/stability enhancement structures within Dugout Creek upstream from the proposed disturbed area. SCM commits to the installation of structures similar to those identified in Figure 7-12 should all regulatory agencies and SCM be in agreement. The location and type of structure will be correlated with UDWR, U.S. Fish and Wildlife Service, and the Division.

Pace Canyon

Due to the limited size of disturbance associated with the fan portal facilities, impacts to "Habitats of Unusually High Value" will be minimal.

322.300 Fish and Wildlife Service Review

If requested, SCM authorizes the release of information pertaining to Section 322 and 333 to the U.S. Fish and Wildlife Service Regional and Field office for their review.

323 Maps and Aerial Photographs

The permit area was mapped by use of a mosaic of aerial photographs and assured by ground inspection in some areas. Maps are contained within the reports provided in Appendices 3-1, 3-2 and 3-3.

During a meeting with the UDWR on January 20, 1998 Ben Morris requested that "the nest locations and related data gathered in the 1997 raptor survey of the Dugout Canyon Mine area be kept confidential". Therefore this survey will not be discussed or presented in this permit document, but can be reviewed by Division personnel within the Dugout Canyon Mine "confidential binder". The confidential binder contains Plate 3-2 which shows the location of nests found during the raptor surveys conducted by UDWR. In a Technical Analysis (Task ID #1915) for the inclusion of the SITLA Lease into the permitted area, instructions were given by UDOGM personnel to remove this information from the confidential folder and include it in the M&RP. This information is currently contained in Appendix 3-3.

Vegetation drawings and appendices within the permit area not included in the M&RP are included in the following amendments:

Refuse Pile Amendment

RA Figure 3-1 Surrounding Representative Vegetation Communities

RA Figure 3-2 Vegetation at Site Prior to Mining Disturbance

RA Attachment 3-1 Vegetation Data

Methane Degassification Amendment

Figure 3-1 Vegetation Reference Areas

Figure 3-2 Adjacent Vegetation

Attachment 3-1 Vegetation Inventory

323.100 Location and Boundary of Proposed Reference Area

SCM will use range sites as described and designated by the NRCS Range Handbook and the UDOGM Vegetation Guidelines. Further description can be found in Section 356.100.

Mt. Nebo Scientific did sample a reference area during its 1996 vegetation survey, however SCM does not currently plan to use this data. Reference area(s) are not designated on any plate or figure within this M&RP, except as noted in Section 323.

Pace Canyon

The reference area for the fan facilities is shown on Plate 3-1E. The reference area was inventoried by Mt. Nebo Scientific in August of 2003 (Appendix 3-4). The total living cover was 57.43%, of which 26% was overstory and 31.43% was understory species. The most common overstory species were Douglas fir, Utah juniper and pinyon pine. The most common understory species was big sagebrush, with other native perennial species including Indian ricegrass and Salina wildrye. Species composition calculations reveal that woody species comprise 61.16% of the living understory cover, followed by grasses (33.36%) and forbs (5.47%). The number of woody species in the density measurements was estimated at 2,145 individuals per acre.

323.200 Elevations and Locations of Monitoring Stations

Raptor nest locations and elk and deer range are shown on Plate 3-2. The permit area contains no fish monitoring stations.

323.300 Facilities for Protection and Enhancement

Sections 333.300 and 358.500 contain additional discussion pertaining to protective measures to be taken by SCM in behalf of wildlife.

323.400 Vegetation Type and Plant Communities

Vegetative types and plant communities are outlined on Plate 3-1 and 3-1A of this application.

Vegetation types and plant communities on Plate 3-1 were interpreted directly from aerial photographs except for selected areas. The inclusion of small vegetation units was limited and included the exclusion of small, long or narrow units of vegetation within other units. Vegetation depicted on Plate 3-1A represents vegetation ground surveyed and identified in the field.

Additional information pertaining to vegetation type and plant communities in Pace Canyon is provided in Appendix 3-4

330 OPERATION PLAN

331 Measures Taken to Disturb the Smallest Practicable Area

No vegetative disturbance is anticipated beyond that encountered during construction of the surface facilities and fan facilities. The area to be disturbed by operational facilities will be kept to a minimum. Only facilities required to maintain the coal operation or satisfy environmental or safety requirements will be built.

Disturbed areas will be seeded with a mixture which will meet the requirements necessary to stabilize and provide cover; and with sufficient production and diversity characteristic to satisfy regulatory requirements.

Sections 341 describes the seed mixes to be used in both interim and final reclamation of the disturbed areas. For both the interim and final reclamation mixes, the vegetation data were evaluated to determine seed mixture constituents in light of production, cover, and diversity requirements. The soils report was reviewed to select species adapted to the soil's physical and chemical condition. Plant species were selected on the basis of wildlife needs and requirements. In addition, the operations plan was reviewed to determine the need for species with quick establishment, rapid spreading, and high erosion control potentials.

332 Description of Anticipated Impacts of Subsidence

Subsidence and its anticipated impacts are discussed in Sections 333 and 525 of this M&RP.

The potential effects of subsidence on nests could be one or several of the following:

- Displacement and relocation of nesting raptor(s)/birds,
- Injury to or death of nest inhabitants,
- Nest destruction.

Subterranean changes caused by subsidence to wildlife habitat is not currently understood. Subsidence could disrupt burrow systems destroying the home and habitat of burrowing mammals, reptiles, and amphibians and possibly cause death to some species in the immediate area. Since subsidence occurs systematically and in small areas at a given time, only localized populations will be impacted and only for a short period of time. Reproductive potential coupled with dispersal will facilitate recovery and negate the temporary population reduction.

Possible Short-Term and Long Term Impacts to Species Dependent on Springs, Creeks and Drainages

Impact to species dependent on springs, creeks and drainages could include disturbance of shelter, food, increased evaporation, rise and/or decrease in water temperature, water flow, and bank stability. Most species of wildlife are highly adaptable, while others with limited mobility are not. These species (mollusk (Physella virgata) and tiger salamander, mentioned in the TA on Task ID #1915) have likely been impacted by the drought conditions in Utah since 1999. These species have either died or have moved to locations where water and habitat are more abundant. If they have moved, then should their habitat change again, they will likely move to a more suitable area. Subsidence could in the future impact these species, however to the best of the permittee's knowledge neither the listed species or other species dependent on springs, creeks and drainages have been identified as being impacted by subsidence within the permitted area.

It is anticipated that streams within the permit area will not be significantly impacted as discussed in Chapter 5, Section 525.100. Interruptions of flow within perennial, intermittant, and ephemeral streams is not anticipated. Therefore, flows sustaining riparian and stream bank vegetation should continue during and after subsidence. Refer to Section 731.200 for a proposed monitoring and mitigation plan.

333 Plan to Minimize Disturbances and Adverse Impacts

General control and mitigation measures addressing potential operational related biological impacts will include the following:

- Minimizing the total area of disturbance,
- Design, construction, and operation of facilities to minimize biological impacts including barriers to wildlife movements,
- Design and installation of electrical equipment to minimize electrocution hazards,
- Establishment of stream buffer zones,
- Control and monitoring of surface discharges and water quality,
- Exclusion of wildlife from potentially hazardous areas, and
- Reclamation of disturbed areas when they are no longer needed.

The raptor survey by the UDWR in 1997 lists the three nests within Section 16, T13S, R12E, as being two inactive hawk nests and an old dilapidated golden eagle nest. The dilapidated nest and an inactive hawk nest are located over a area planned for mining during 2001 to 2005 (comparison of Plates 3-2 and 5-7). The second inactive hawk nest is within the area of potential subsidence but not over mining. Since the condition of these nests may change by the time mining reaches their location a plan for their protection or taking will not be determined at this time.

The nests in Section 16 will be monitored in the annual raptor survey. Nine months or the summer prior to the period of potential subsidence a determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection of the nest(s).

Section 22, T13S, R12E contains a raven nest and an active golden eagle nest. Bill Bates and Ben Morris concurred that "the raven nest in Section 22 was not of particular concern, but that the golden eagle nest should be monitored." See Sections 322.200, 333.300 and 358.100 for the raptor monitoring commitments. The golden eagle nest is located over a area planned for

mining during 2000 to 2001 (comparison of Plates 3-2 and 5-7). This nest will most likely continue to be active. The plan to protect the nesting birds will include a survey of the nest location the year prior to second mining to determine activity. In addition, the potential for laying, incubation or existence of young will be evaluated. The spring prior to the period of potential subsidence a determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection of the nest(s) (see Section 333.300).

Only one of the old dilapidated golden eagle nests surveyed in Section 23 during 1997 was surveyed during the 1998 raptor survey. The UDWR in Price and Salt Lake and the Fish and Wildlife Service both in Salt Lake and Denver have been contacted to determine the need for a "take permit" for this nest.

According to a comparison of the raptor surveys performed in 1995 and 1997, the nest inhabitants, conditions and existence may change. Therefore each nest should be evaluated separately and not as a collective. Methods of protection will be determined on a case by case basis using the "best technology available".

The raptor nests located in the survey taken in 1998 are plotted on Plate 3-2 (Confidential Folder).

333.100 Minimized Disturbance to Endangered or Threatened Species

SCM will apply all methods necessary to minimize disturbances or any adverse effects to endangered and threatened species listed on the tables in Appendix 3-3.

333.200 Species and Habitats

All species and habitats within the permit area will be protected to the best of SCM ability. Wildlife habitat protection will be considered in the construction of facilities. For additional information, see Section 333.300.

333.300 Protective Measures

Upon notification or suspicion of raptor nests within the permit boundary cliff escarpment subsidence zone the following inventory will be taken to determine the potential actions to be taken by SCM.

- Verify the existence of a nest or nests,
- Verify occupation by birds/raptors, eggs or young,
- Determine the condition of nest or nests,
- Location of nest in relationship to recoverable resource (creation of table with nest location number and planned year for undermining).

The information collected in the inventory will be discussed with various agency personnel (i.e., UDOGM, USFWS, DWR, etc.). SCM and the various agencies will determine:

- a method of avoidance when possible,
- determine seasons/months for nests to be covered/uncovered,
- explore alternative methods of protection or removal, and
- develop a mitigation plan when needed.

The method(s) to be used will be determined prior to the period of potential subsidence.

SCM does not currently know the exact locations or thicknesses of recoverable resource, therefore to determine the potential loss of revenues is premature in relation to the avoidance of a raptor nest or nests. Each nest(s) and its corresponding occupant(s) and circumstances will be evaluated by a qualified person nine months or the summer prior to the period of potential subsidence. A determination by SCM, UDWR (Fish and Wildlife) and UDOGM will be made as to the method(s) to be used for the protection/avoidance/removal of the nest(s) (refer above to inventory listing in this section).

SCM commits to include wildlife awareness and protection training in it's annual training curriculum for employees and request the haulage contractors to provide the same training for it's employees.

Wildlife accustom to their current sources of food may be endangered with a change or enhancement of plant species. The improvement or addition of water developments can act to concentrate wildlife in a specific area, thus causing compaction to soils and over grazing of vegetation in an area. Areas which may be fenced to exclude livestock from an area, may also exclude wildlife, thus causing increased competition for food and territory in another area. Since SCM is unaware of the possible advantages or disadvantages to change in an area of habitat, we commit to use the best technology currently available to handle specific concerns, and which will benefit the greatest range of wildlife. Should the enhancement of habitat outside the disturbed area become necessary to attract wildlife away from the mining facilities, efforts will be coordinated with the UDWR.

Revegetation of disturbed areas, as part of the reclamation effort, will include a mixture of grasses, forbs, shrubs and trees which are beneficial to wildlife.

As part of the overall surface water monitoring program, SCM will monitor surface water flow to determine it's relationship to area subsidence. See Chapter 7 of this M&RP for a discussion of the water monitoring program.

Areas of potential mining will be surveyed for raptor nests prior to the beginning of mining and two seasons after mining has ceased. Pertinent data gathered in these surveys will be included in this M&RP and evaluated by qualified personnel to determine the method(s) to be used to avoid, protect, or take the raptor's nest(s).

Before a pesticide is used, the type and concentration will be approved in conjunction with UDWR or the Division.

During the construction of the Dugout Mine, wildlife in the area will most likely be displaced due to the noise and added human activity. Construction, mining, supplier personnel and their corresponding equipment will be required to stay within the disturbed area boundary during construction activities. Loading, unloading, and staging of materials and equipment designated for the construction of the Dugout Canyon Mine facilities will be done within the disturbed area boundary. Fluids used to maintain construction equipment will be stored in a safe method, to prevent contamination.

340 RECLAMATION PLAN

The reclamation plan will include the following: seed mix, rate of seedlings per acre, stocking rates for shrub and tree plantings, planting techniques, fertilization methods, and amount and frequency of application. The fish and wildlife plan for the permit area is outlined in Section 342.

341 Revegetation

The reclamation plan for final revegetation is included in this section for lands to be disturbed by coal mining and reclamation operations.

The short-term goal of this revegetation plan is the immediate stabilization of the disturbed sites through erosion control. This objective will be achieved through controlled grading practices, proper seedbed preparation to encourage rapid plant establishment, inclusion of rapidly establishing species in the seed mixture to be planted, and mulch application.

The long-term goals are to establish useful, productive range and wildlife habitat. These goals will be attained through the selection and placement of desirable and productive plant species, and a commitment to monitor and maintain revegetated areas throughout the bond liability period.

341.100 Schedule and Timetable

The reclamation timetable is outlined in Figure 5-4. The reclamation monitoring schedule is outlined in Table 3-3.

The planting of seeds and seedlings will be undertaken at the most feasible time following disturbance activities. Planting will begin after the plant growth medium has been replaced. Final reclamation grasses, forbs, shrubs, and seedlings will be planned for planting in late August through early October. Should the planting window close prior to completion of seeding, a sterile, quick growing ground cover will be planted to control erosion during the winter months. The final reclamation seed mixture will be planted the following spring and fall.

341.200 Descriptions

Species and Amounts of Seed. All revegetated areas within the disturbed area boundary will be planted with the seed mixes listed below:

Interim Seed Mix (Drilled Quantities)

SPECIES	# pls/acre
Indian ricegrass	2
Western wheatgrass	3
Slender wheatgrass	3
Thickspike wheatgrass	4
Kentucky Bluegrass	1
TOTAL	13

Final Reclamation Seed Mix #1 (Drilled Quantities)

SPECIES	# pls/acre
Grasses, Forbs, and Shrubs	
Bluebunch Wheatgrass	3.0

Western wheatgrass	4.0
Slender wheatgrass	1.0
Thickspike wheatgrass	1.0
Idaho fescue	1.0
Indian ricegrass	2.0
Blueleaf aster	0.5
Blue flax	1.0
Palmer Penstemon	0.5
Northern sweetvetch	1.0
Mountain big sagebrush	0.5
Louisiana sagebrush	1.0
Fourwing saltbrush	1.0
Bitterbrush	1.0
Curl-leaf mountain mahogany	1.0
TOTAL	19.5

Transplants and/or seedlings per acre

Snowberry	75
Utah serviceberry	75
Pinyon pine	200
Utah juniper	200
TOTAL	550

The rate of seeding per acre when broadcast will be doubled of the rate of seeding when drilled.

Final Reclamation Seed Mix #2 (Drilled Quantities)

SPECIES	# pls/acre
Grasses, Forbs, and Shrubs	
Mountain brome	3.0
Western wheatgrass	5.0
Indian ricegrass	3.0
Slender wheatgrass	3.0
Thickspike wheatgrass	3.0
Kentucky bluegrass	1.5
Columbine	1.0
Blue flax	1.0
Palmer penstemon	1.0
Northern sweetvetch	.5
Louisiana sagebrush	1.0
TOTAL	23.0

Transplants and/or seedlings per acre

Carex spp.	500
Horsetail	500
TOTAL	1000

Streambanks/channel bottom will receive the following trees[a] and shrubs

	Seedlings/acre
Narrowleaf cottonwood	250
Rocky Mountain maple	250
Willow [b]	4000
Woods rose	1000
Snowberry	250
Utah serviceberry	250
Blue elderberry	250
Chokecherry	250
Golden current	250
TOTAL	6750

* UDWR requested no conifers be included in the riparian seed mix.

(b) Cuttings/transplants and/or seedlings will be used. The quantity of willows to actually be planted may vary due to the availability of suitable area within the channel for planting. CFC requests permission to consult with a botanist and UDOGM at the time of reclamation to determine the final number of willows to be planted and to prepare a plan for potential planting and replanting should seedling be lost due to pestilence. It may be beneficial to plant the willows over a period of years as the stream has time to deposit sediment, thus providing natural areas for planting. If deemed appropriate by the botanist and UDOGM at the time of reclamation the 4,000 willows per acre commitment will be met.

The rate of seeding per acre when broadcast will be doubled of the rate of seeding when drilled.

Final Reclamation Seed Mix #3 (Broadcast Quantities)

SPECIES	# pls/acre	# pls/sq. ft.**
Grasses, Forbs, and Shrubs		
Salina Wildrye (379,500 seeds/lb)*	2.5	22
Indian Rice Grass (162,000 seeds/lb)*	3.5	13
Galleta Grass (150,000 seeds/lb)*	3.5	12

Muttongrass (2,000,000 seeds/lb)*	0.5	23
Mtn. Snowberry (54,000 seeds/lb)*	4.0	5
Wyoming Big Sage (2,500,000 seeds/lb)*	0.5	29
TOTAL	14.5	104

* Native Plants

** Rounded nearest whole seed

Seed Mix No.1 will be used on the majority of the Dugout Canyon disturbed area (Pinyon-Utah juniper - upland very steep shallow loam, Plate 3-1A) . Seed Mix No. 2 will be used to reseed the riparian area of Dugout Creek (Plate 3-1A). Hydrophytic vegetation will be planted during the low flow of the reclamation channel. Seed Mix No. 3 will be used to reclaim the Pace Canyon Fan Portal facilities. Although, native forbs were found in the reference area for the proposed Pace Canyon distrubance, the species were not readily available for purchase, therefore they have not been included in the seed mix.

Method Used for Planting and Seeding. The surface will be ripped to between 6 and 24 inches to reduce surface compaction. Ripping will be completed on approximately 4-foot centers. Final ripping depths will be determined by the soil materials being ripped. On slopes too steep for ripping the soil materials will be at a minimum pocked/gouged.

Following ripping, topsoil (or substitute topsoil) will be applied to the ripped surface and left in a roughened state. Topsoil samples will be collected and sent to the laboratory for analysis to determine fertilizer requirements. The area will be broadcast fertilized if recommended ~~with the recommended fertilizer~~ using a hand held "cyclone-type" seeder in smaller areas, and applied with hydroseeding equipment ~~in a hydroseeding mixture or with a rotary implement attached to the revegetation tractor~~ in larger areas. Where possible, a ripper equipped tractor or other appropriate

TABLE 3-3
RECLAMATION MONITORING SCHEDULE

	YEAR									
	1	2	3	4	5	6	7	8	9	10
QUALITATIVE SAMPLING	X	X	X	X	X	X	X	X	X	X
QUANTITATIVE SAMPLING										
Cover		X	X		X				X	X
Frequency		X	X		X				X	X
Woody Plant Density		X	X		X				X	X
Transplant Survival	X	X	X		X					
Productivity									X	X

equipment will be used to incorporate the fertilizer into the soil. On slopes too steep to accommodate the use of a tractor or other appropriate equipment the fertilizer will be incorporated with the track hoe bucket teeth or other Division approved technology. All nutrients will be applied in a single application.

Seeding for grasses, shrubs, and forbs will be accomplished by drilling and/or broadcasting. All equipment used will be equipped with metering devices. Except as noted below all areas will be fertilized and seeded using the same methodology.

Broadcast seeding will be used on slopes too steep to accommodate a tractor.

Seedlings/transplants will be planted by first clearing a circle of 12 to 24 inches in diameter from which mulch materials and grasses will be cleared. The hole will be dug 4 to 6 inches deeper than the seedling roots to accommodate positioning of the seedling. Fertilizer will either be mixed with the loose soil from the hole or a fertilizer tablet will be planted with each seedling. After seedling placement, the hole will be backfilled with soil and fertilizer then lightly tamped. A gently sloped

basin will be formed around the seedling to catch water. The basin will be mulched to aid in moisture retention.

Technical notes (No. 23, September 1993) and project information data published by the NRCS were consulted to provide detail for planting the riparian area, willows, and cottonwoods.

"Rhisomatous willows usually should be planted on inside curves of a stream channel, they are rarely found on sharp outside curves in nature. Shrubby species are normally planted on outside curves of a stream channel as a continuous barrier. Plant the entire reach with the same species. Taller shrubby species may also be planted mid-bank to upper bank and on the floodplains for diversity and additional stabilization or as a buffer zone. Plant tree species up the bank from the shrubby species or on top of the bank."

"Plug, containerized, bare-root, potted and paper-sleeve planting are best used on mid-bank to upper bank or floodplains where long periods of inundation or water erosion is minimized, but where adequate moisture is available through natural precipitation. Where plant have a low risk of physically being pulled or eroded out due to shallow rooting systems during establishment and where there is no competing vegetation."

Transplants (cuttings, whips, plugs, bare-root, potted) "less than 3/8" inch diameter are not recommended because energy reserves in the stems are limited. Pole cutting (3/4" large diameter unrooted stems) are recommended for most planting from water line to mid-bank. Pole cuttings of willows and cottonwoods are also recommended on upper-banks and flood plains where the water table is relatively deep."

"Cutting length is largely determined by the depth to the mid-summer water table and erosive force of the stream at the planting site. Planting can occur at the water line, up the bank, and on top of bank in relatively dry soil, as long as cuttings are long enough to reach into the mid-summer water table. Make sure, several inches of cutting are in the mid-summer water table, 3-4 buds are above ground, and no less than ½ the total length is in the ground"

"However the larger the cutting diameter, the longer the cutting should be, and the deeper the hole should be. Larger diameter and longer cuttings will be needed for more severely eroding sites and where the water table is deeper."

"Plant the cuttings about 1 - 3 feet apart for shrubby types and 6-12 feet apart for tree types. In areas where you expect erosion, plant shrubby types 1 - 1.5 feet apart to better protect the banks. Exact spacing between tree-types further up the bank and shrubby types below should be based on crown characteristics and height. General ideas on spacing can be found in the Idaho Tree Planting Handbook."

"A tractor-mounted post hole digger, a one or two man post hole digger, a soil auger, a large bar, a planting shovel, or just punching the cutting into most soil have all been used successfully in the past to plant willows."

The reclaimed riparian area will be planted with cuttings/transplants/seedlings using the following guidelines as suggested by NRCS literature.

- The Idaho Tree Planting Handbook or similar instructional material will be consulted during reclamation to determine the spacing for the planting of shrubs and tree cuttings/transplants/seedlings. Trees and shrubs will be interspersed with areas seeded with grasses and forbs.
- Species will be planted with a tractor-mounted post hole digger, a one or two man post hole digger, a soil auger, a large bar, a planting shovel, or punching into soil.
- Tree species will be planted up the bank from the shrub species or on top of the channel slope.
- Shrubs species will be planted between the top of the riprap and the top of the channel slope.
- Willows will be planted in the riprap on the channel side slopes and the edges of the channel bottom.

- Stems for planting will be 3/8" diameter or larger.

- Length of cuttings will be determine by where they are planted (i.e. water line, top of slope or etc.), but will be long/large enough to reach into the anticipated water table, with 3-4 buds above ground.

The cuttings/transplants/seedlings will be interspersed with areas of grass and forbs in a mosaic pattern as in the current riparian area. The shrub density data from the 1997 survey designates the trees within the riparian area to be: 27.2 maples, 96.5 junipers, 107.4 cottonwoods and 28.8 firs per acre. SCM proposes to plant 250 maples and 250 cottonwoods per acre. Junipers and firs have not been included in Seed Mix #2 at the requested of the UDWR. The 500 maples and cottonwoods should be sufficient to achieve bond release if the mortality rate is between 10 and 25% (Dan Ogle, NRCS Plant Material Specialist). NRCS guidelines are considered recommendations and SCM understands they are ultimately responsible for meeting revegetation success standards.

If cottonwoods are planted as cuttings or poles they will be long enough to reach the water table and large enough in size (1 - 3" diameter) to have sufficient energy reserves for survival. An irrigation program will be considered if the cottonwoods are planted as transplants. The particular character of cottonwood to be planted will be determined at the time of reclamation.

Transplants with root balls will be planted as described previously and with the recommendations of published literature available at the time of reclamation. Channel slopes as currently designed, vary between 3 and 4 feet.

Figure 3-1 is provided to approximate the location of each planting zone described above, not as a typical design of the stream channel slopes, their height, width or length.

Seeding methods are discussed previously in this section.

The Division has requested information concerning the average high and low water mark for the reclaimed Dugout Creek channel as a means of evaluating the potential survivability of

phreatophytes which will be planted during reclamation. However, from a hydrologic standpoint the concept of average high and low water marks in vague for a channel since the levels are both time- and probability-dependent. For example, it is common to speak of the water-surface profile, which might be expected during the 10-year, 7-day low-flow periods or the 25-year, 6-hour precipitation event, but not the "average" low flow or the "average" high flow. SCM will provide such data if it can be meaningfully defined and will assist with revegetation success. In any event, cuttings/transplants will be planted to facilitate successful re-establishment of the riparian vegetation, with the depth of planting being determined by a consensus of the published literature which is available at the time of reclamation and the drilling of periodic holes along the reclamation channel to determine the depth to the water table.

Mulching Techniques. Following seeding, the disturbed areas will be mulched with a Division-approved mulching material. For bonding calculations, wood fiber mulch will be the assumed mulching application. Application will be initiated at the tip of the slope and working downhill. Mulch will be applied at the rate of 2000 pounds per acre and anchored with a tackifier.

In consultation with the Division, should a determination be made that a slope(s) is too steep to retain a mulch application, the slope(s) will be pocked/gouged and will receive no mulch application. Mulching and revegetation will not be attempted on sheer rock outcrops.

Mulch used for the mitigation project in 1998 of the upper portion of Dugout Canyon is discussed in Section 322.200.

Irrigation, Pest and Disease Control. No irrigation is planned and pesticides will not be used unless previously approved by the Division.

Measures Proposed for Revegetation Success. SCM will plant species of the same seasonal variety as those existing prior to the proposed disturbance.

To effect bond release at the end of the 10-year responsibility period, SCM will measure required vegetation variables (ground cover, herbaceous productivity, and woody plant density) as outlined on Table 3-3. Measurement will occur during the same time each year using appropriate techniques.

Productivity sampling will involve use of a sample random technique whereby 1 to 2 m^2 plots (rectangular in shape) will be clipped by life form for all current annual production. Sample parameters determined for these variables will be used to test the success of revegetation during each of these years and will prove establishment of adequate cover, suitable productivity, reasonable density, and adequate species composition.

The estimated parameters for the variables of ground cover, herbaceous productivity, and woody plant density will be obtained in a statistically-adequate manner. Refer to Section 356.200 for a discussion on revegetation success standards.

The revegetative success standard for cover in the Pinyon-Juniper area is 66% and 85% for the riparian area in Dugout Canyon.

Pace Canyon

Success of revegetation and stabilization of the fan portal facilities area will be evaluated during each growing season as outlined on Table 3-3, when cover and compositions studies are most feasible. Sample parameters determined from reference area data will be used to test the success of revegetation and will prove establishment of adequate cover, suitable productivity, reasonable density, and adequate species composition. Student's t-tests were employed to compare the total living cover and total woody species density of the proposed disturbed area and it's reference area (Mt. Nebo, Appendix 3-4).

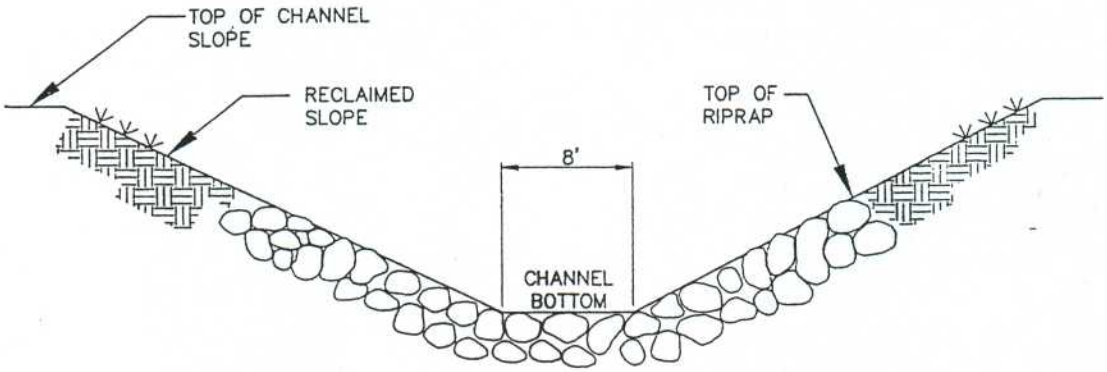

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FIG 3-1. RECLAMATION CHANNEL SLOPE DEFINITIONS

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341.300 Greenhouse Studies, Field Trials or Other Equivalent Studies

SCM will comply, should the Division provide evidence to support additional testing to demonstrate that reclamation as required by the State Program can be accomplished according to information provided in this M&RP.

342 Fish and Wildlife

Revegetation to sustain and improve wildlife habitat will be SCM's primary concern following the termination of mining operations. High value habitats will be restored and enhanced beyond their pre-mining conditions since the area is being redisturbed after previous mining. The plan is consistent with Sections 330 and 358.

342.100 Enhancement Measures

Enhancements of the stream channel are discussed in Sections 322.200 and 762.100. No additional enhancements are planned.

342.200 Plants Used for Wildlife Habitat

The plant species in the reclamation seed mix are consistent with those presently grown in the permit area, with additional species added for diversity as requested by the Division. Section 341.200 contains the proposed reclamation seed, tree, and shrub mix.

Nutritional Value. The nutritional value will be consistent with that of vegetation in the surrounding areas.

Cover. The goal of SCM is to establish plant species which will provide sufficient cover for the fish and wildlife of the area. See Section 341 for additional discussion.

Ability to Support and Enhance. The plant species included in the proposed reclamation mixes have the ability to support and enhance the fish or wildlife habitat after the release of the performance bonds. Shrubs and trees will be planted to enhance survival and provide wildlife habitat. The trees and shrubs in the final reclamation seed mix will be used to ensure establishment of an enhanced vegetation community within the disturbed site. The disturbed riparian community will be restored and enhanced during reclamation efforts.

342.300 Cropland

Cropland is not a postmining land use.

342.400 Residential, Public Service and Industrial Land Use

No residential, industrial or public service use is planned at the present time for the permit area following the termination of mining.

350 PERFORMANCE STANDARDS

351 General Requirements

SCM commits to conduct all operations in accordance with the plans submitted in Sections R645-301-330 through R645-301-340 of the permit application.

352 Contemporaneous Reclamation

Reclamation activities prior to final reclamation will, to the extent feasible, be performed contemporaneously with mining operations. Areas to receive interim reclamation will be seeded with the interim seed mix.

The interim seed mix (Section 341.200) will be used to establish a shallow rooting cover of grasses for those areas disturbed during the development of the Gilson Well pad and relocation of Dugout Creek (west fork). The riparian area associated with the disturbance will receive reclamation as dictated in the stream channel alteration permit and Section 341 of the M&RP. The Pace Canyon Fan Portal topsoil stockpiles will be contemporaneously reclaimed using the only the grass seeds specified in Seed Mix No. 3.

Revegetation will not be done in areas required to be kept barren of vegetation such as areas around mine ventilation openings.

353 Revegetation: General Requirements

A vegetative cover will be established on all reclaimed areas to allow for the designated postmining land use of livestock grazing and wildlife habitat. Other than a road which will be retained through the facilities area following reclamation to allow access to private land within the permit area, all roads within the disturbed area boundary will be reclaimed. The vegetative cover will be in accordance with the approved permit and reclamation plan. All species of vegetation to be used in reclamation activities, whether planted by seed or seedling, will be approved by the Division (i.e. interim, mitigation, #1 and #2 seed mixes). Seed Mix No. 3 will be used at the Pace Canyon Fan Portal facilities during reclamation, the entire reclaimed surface will receive this seed mix except for the realigned road segment. The road is used as access by the BLM and private land owners.

353.100 Vegetative Cover

The seed mix proposed for revegetation is intended to provide vegetative cover that will be diverse, effective, and permanent. The seed mixture was selected with respect to the climate, potential seedbed quality, erosion control, drought tolerance, and the mixture's ability for quick establishment and spreading.

Native Species. The reclamation vegetative mixture (seeds, shrubs, and trees) will be comprise of species indigenous to the area, capable of achieving the postmining land use as approved by the Division. Diversity of species should allow ultimate utilization of plants by wildlife and domestic livestock.

The revegetative species will be purchased from suppliers who will certify their percentages of purity, germination, hard seed, and percentages of maximum weed seed content.

Extent of Cover. The vegetative cover will be at least equal in extent to the cover as determined by the range site sampling as discussed in Section 341.200. The Pace Canyon Fan Portal area will be compared to the reference area shown on Plate 3-1E.

Stabilizing. The vegetative cover mixture is capable of stabilizing the soil surface from erosion.

353.200 Reestablished Plant Species

Compatible. The reestablished plant species have been selected to insure their compatibility with the approved postmining use.

Seasonal Characteristics. The revegetation plant species will have the same growing season as the original vegetation, or in this instance, as the adjacent areas.

Self-generation. The reestablished plants are species capable of self-generation and plant succession.

Compatibility. The seed mix suggested for revegetation contains plants native to the area and compatible with the plant and animal species of the permit area.

Federal and Utah Laws or Regulations. The seed mixture purchased to revegetate the mine area will contain no poisonous or noxious plant. No species will be introduced in the area without being approved by the Division.

353.300 Vegetative Exception

SCM does not require vegetative exception at this time.

353.400 Cropland

The permit area contains no land designated as cropland.

354 Revegetation: Timing

SCM will follow the recommended guidelines for revegetation as discussed in Section 341.100.

355 Revegetation: Mulching and Other Soil Stabilizing Practices

Mulch and/or other soil stabilizing practices (pocking, gouging, roughening, etc.) will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes (see Section 341.200). SCM will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes.

356 Revegetation: Standards for Success

The standards for revegetation success are discussed in this section and in Section 341.200.

Range Site Success Standards for Reclamation (Dugout Canyon Facilities):

	Pinyon/Utah Juniper	Riparian
Ground Cover	66%	85%
NRCS Production	800 lbs/acre	1500 lbs/acre
Shrub-Tree Density/Stocking	2200 stems/acre	2200 stems/acre
Diversity	2 Tree/shrub species 3 Grass species 2 Forb species	2 Tree/shrub species 3 Grass species 2 Forb species

For a species to be counted as one of the species that constitute vegetation diversity it must exist in the actual plant community at a minimum of 5%.

The sampling methods to be used during reclamation will be specific to the requirements at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots) and productivity (clipping and/or NRCS estimation). The Jaccard's Community Coefficient will be used to calculate acceptable plant similarity and diversity.

During the Fall of 1997, productivity for the disturbed area was determined by George Cook, a range conservationist for the NRCS. Mr. Cook determined the Pinyon/Utah Juniper area to be in good condition with 800 lbs/acre air dry weight production. The riparian area was determined to be in fair condition with 1500 lbs/acre of air day weight production. Should the NRCS determination of production be insufficient to satisfy the requirement for standards of success, SCM commits to sample productivity at a corresponding range site.

Range sites for reclamation comparison purposes were chosen by a qualified person contracted by SCM and in cooperation with the Division. Range sites in Fish Creek Canyon representing both the pinyon/juniper and riparian vegetation types were sampled for cover in September, 1998 (Appendix 3-1). These specific range sites correspond with the cover quantities sampled for the pinyon/juniper and riparian areas within the Dugout Mine disturbed area boundary. The cover data

for each range site was submitted to the Division for evaluation and approved for reclamation comparison (Appendix 3-1). The designated range sites will be used as a reference area until final revegetative bond release has been issued. The location of the area to be used for range site comparison is designated on Plates 3-1 and 3-1D .

The sites for sampling were chosen (September, 1998) in cooperation with Paul Baker (UDOGM).

356.100 Success of Revegetation

The success standards for approval will be judged on the effectiveness of the vegetation for postmining land use and the standards outlined in Section 353.

Within the Utah Division of Oil, Gas and Mining Vegetation Guidelines (Revised February, 1992) three methods for sampling vegetation are discussed; reference areas, range sites and the baseline data method. Each method describes the requirements for its subsequent use, however the sampling of diversity was not discussed within any of these methods.

The baseline data method could not be used at the Dugout Canyon Mine site due to previous disturbance by mining. Likewise the reference areas method could not be used since reference areas were not approved by the Division. Therefore the range site method has been adopted for use at the Dugout Canyon Mine.

The range site number used for comparison of revegetation success is 033XY342UT, upland very steep shallow loam (Pinyon-Utah Juniper). The area sampled by Patricia Johnston in 1997 met the requirements of Method #2 - Range Sites of the UDOGM Vegetation Guidelines, February 1992. Legible copies of data sheets from the sampling are included in Appendix 3-1.

Sampling Techniques (Dugout Canyon) . SCM will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outlined in the Division's "Vegetation Information Guidelines" for sampling.

Sampling Techniques (Pace Canyon)- Permittee will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outline in the Division's "Vegetation Information Guidelines, Appendix A" for sampling.

The sampling methods to be used during reclamation will be the "best technology currently available" at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots), productivity (clipping) and the "best technology currently available" will be used to calculate acceptable plant similarity and diversity.

Standards for Success. The standards for success will include criteria representative of unmined lands in the area of the permit and as discussed in Section 356.200. In **Pace Canyon,** the standards for success will include criteria representative of undisturbed lands in the area of the disturbance (reference area), as means to evaluate ground cover, production and stocking of the reclaimed site. The sampling techniques for success in Pace Canyon will use a 90 percent statistical confidence interval as required by R645-301-356.120.

356.200 Standards for Success

Standards of success will be applied in accordance with the approved postmining land use as described in this section.

Grazing Land or Pasture Land. The ground cover and production of living plants on the revegetated area will be at least equal to the specified success standards.

Cropland. There is no area designated as cropland within the permit area.

Fish and Wildlife Habitat. The success of revegetation for fish and wildlife habitat will be determined on the basis of tree and shrub stocking and vegetative ground cover. Minimum stocking and planting arrangements will be those approved by the Division on the basis of local and regional conditions. Cover success will not be less than that required to achieve the approved postmining land use.

Industrial, Commercial or Residential. The postmining land use for the permit area is not designated for industrial, commercial, or residential use.

Previously Disturbed Areas. Dugout Canyon contains the remains of earlier mining operations. The site was not reclaimed or revegetated following the earlier operations. Pace Canyon contains the remains of earlier mining, disturbance by logging activities, and road access disturbance. The area was neither reclaimed or revegetated following the aforementioned disturbance.

Due to the previous disturbance of the sites, SCM will restore the vegetative ground cover to that of the surrounding area as discussed in Section 341.200 and the ground cover will be adequate to control erosion.

356.300 Siltation Structure Maintenance

Siltation structures will be maintained until removal is authorized by the Division and the disturbed areas have been stabilized and revegetated. Siltation structures will be removed no sooner than two years after the last augmented seeding. For additional details on siltation structures, see Section 542 of this M&RP.

356.400 Removal of Siltation Structures

The land on which siltation structures are located will be revegetated in accordance with the reclamation plan discussed in Sections 353 through 357 of this M&RP.

357 Revegetation: Extended Responsibility Period

SCM will be responsible for the success of revegetation for a period of 10 years following reclamation seeding ~~fertilization, and irrigation (if deemed necessary)~~ of the reclaimed mine area or upon Division bond release.

357.100 Extended Period Begins

The period of extended responsibility will begin the year after the disturbed area has been reseeded ~~and fertilized~~.

357.200 Vegetative Parameters

Vegetation parameters will equal or exceed the approved success standard during the last 2 years of the responsibility period. The success standards are outlined in Section 356.

357.300 Husbandry Practices

SCM will comply with Division-approved husbandry practices which will be normal conservation practices within the region of the mine. These practices may include disease, pest, and vermin control; and any pruning, reseeding, and transplanting required.

358 Protection of Fish, Wildlife and Related Environmental Values

SCM will minimize disturbances and adverse impacts on fish, wildlife, and their related environments as outlined in Section 333.

The intermittent flow of streams within the lease area does not support a population of game fish; therefore, there are no fisheries within the disturbed area to protect. In addition, the streams in Pace and Rock Canyons have intermittent flow and do not support a population of game fish. See Chapter 7 of this M&RP for methods to protect water sources in the area.

Proposed surface disturbance associated with mining activities will be reviewed by the DWR and UDOGM in reference to wildlife exclusionary periods, see letter in Appendix 3-3 concerning mitigation for disturbance in 2004 - 2006.

358.100 Existence of Endangered or Threatened Species

Coal mining will not be conducted where it's operation might jeopardize the existence of any endangered or threatened species. The mining of coal will not result in the planned destruction or adverse modification of these species critical habitat, unless approved by appropriate agency(ies).

Any state or federally listed endangered or threatened specie will be reported to the Division upon its discovery. A ground nest survey for raptors and bird species of special interest was performed prior to site disturbance by a qualified person. A letter report of the ground nest survey is included in Appendix 3-3. Mining operations will proceed in accordance with Division stipulations. These stipulations also apply to reclamation operations at the Dugout Canyon Mine.

Lists of threatened, endangered, and sensitive species are included in Appendix 3-3. In addition, Appendix 3-3 contains 2003 and 2004 survey data for Mexican Spotted Owls and a letter from the DWR concerning installation of nesting boxes to satisfy mitigation requirements.

358.200 Bald and Golden Eagles

Coal mining and reclamation operations will be conducted in a manner protective of bald and golden eagles. SCM will promptly report any golden or bald eagle nests found within the permit boundaries and will proceed with operations in accordance with the Division's stipulations for protection of those nests. Refer to Section 333 for a discussion of methods of nest protection during potential subsidence.

358.300 Taking of Endangered or Threatened Species

SCM understands that there is no permission implied by these regulations for taking of endangered or threatened species, their nests, or eggs.

358.400 Replacement of Wetland and Riparian Vegetation

The Division will be consulted on the best technology to replace and enhance the riparian vegetation to be disturbed.

358.500 Manmade Wildlife Protection Measure

Electric Power Lines. All power lines within the Dugout Canyon Mine disturbed area will comply or be modified to be raptor safe and comply with the guidelines of REA Bulletin 61-10, "Power Line Contacts by Eagles and Other Large Birds". Refer to Plates 4-1 and 5-2 for power pole locations.

Potential Barriers. When possible, structures built by SCM in Dugout Canyon will be designed and built to provide corridors of passage to large mammals.

Pond Protection. Fences or other appropriate methods will be used to exclude wildlife from ponds containing hazardous or toxic materials. However, SCM does not intend to store hazardous or toxic materials in ponds.

REFERENCES:

Blumer, Ralph J., 1979. Environmental Analysis, pp 25-26.

Hoag, Chris J. , How to Plant Willows and Cottonwood Dormant Pole Cuttings for Riparian Rehabilitation. Riparian/Wetland Project Information Series No. 4

Kuchler, A.W. 1975. Potential Natural Vegetation of the Conterminous United States. Amer. Geo. Soc., Spec. Publ. No. 36. Map.

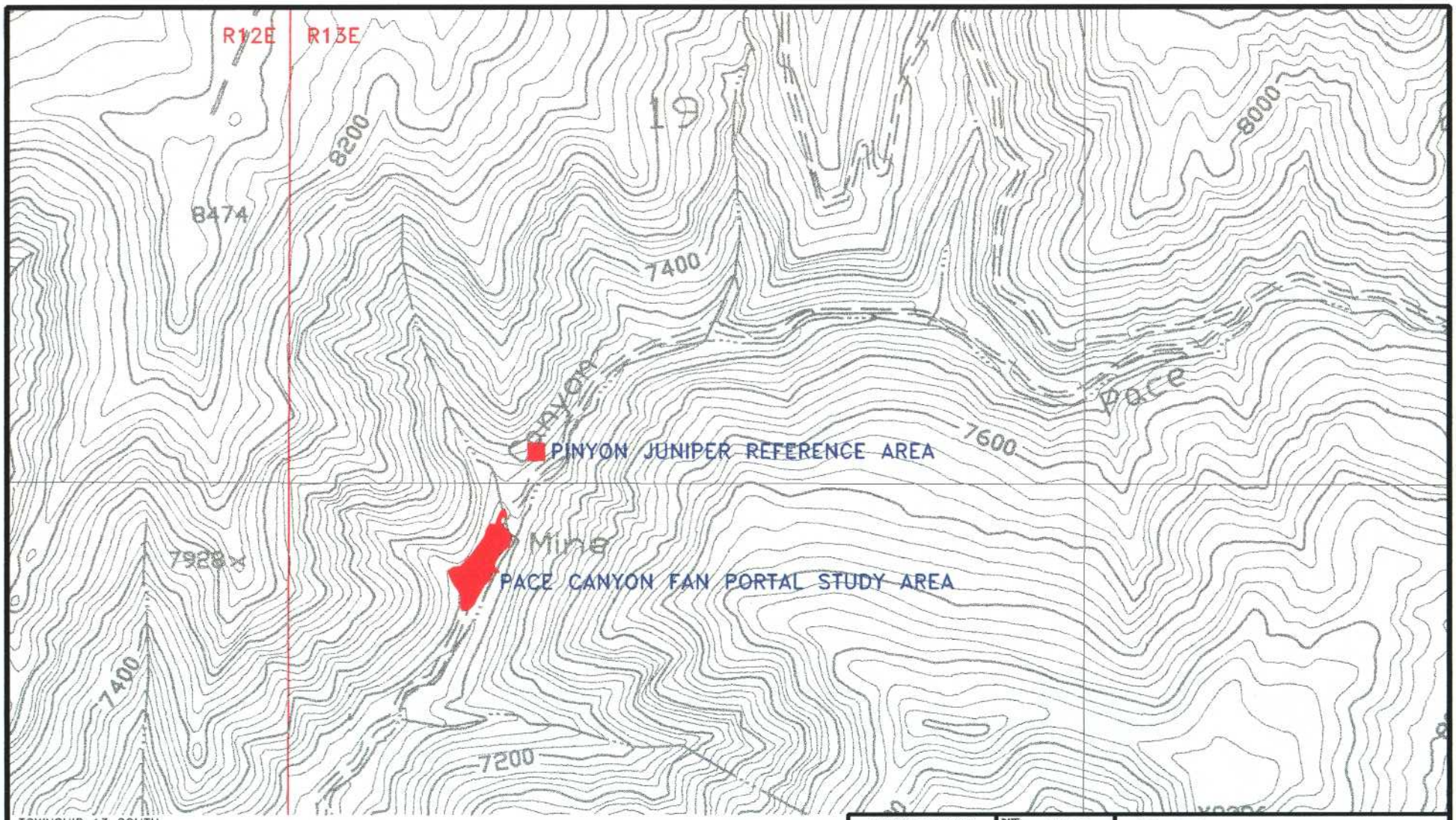
USDA, 1988. Soil Survey of Carbon Area, Utah. Soil Conservation Service.

USDA, 1993. How to Plant Willows and Cottonwoods for Riparian Rehabilitation. Soil Conservation Service, Technical Notes Plant Materials No. 23.

Utah Division of Wildlife Resources, 1990. Fauna of Southeastern Utah and Life Requisites Regarding Their Ecosystems. Pub. No. 90-11.

Utah Division of Wildlife Resources, 1979. Study to Determine Effects of Coal Development on Wildlife in Southeastern Utah. Prepared for Eureka Energy Company.

Utah Division of Wildlife Resources, 1979a. Fish and Wildlife Resources Information - Sage Point-Dugout Canyon Project. Prepared for Eureka Energy Company.



TOWNSHIP 13 SOUTH

NOTE:

VEGETATION AT THE DUGOUT CANYON MINE PROPOSED FAN BREAKOUT AREA, 2003, MT. NEBO SCIENTIFIC, INC.

REGISTERED PROFESSIONAL ENGINEER
No. 189797
LAYNE D. JENSEN
STATE OF UTAH

REVISIONS OR UP-DATES				
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Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN VEGETATION AND REFERENCE AREA

P.O BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER
PLATE 3-1E

EarthFax Engineering, Inc.

APPENDIX 3-4

Pace Canyon Fan Portal
Vegetation and Wildlife Data

VEGETATION AT THE DUGOUT CANYON MINE PROPOSED FAN BREAKOUT AREA 2003

Prepared by

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April 2004

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INTRODUCTION

Canyon Fuel Company has plans to construct a fan portal breakout in Pace Canyon for the Dugout Canyon Mine. In doing so, some disturbance to the existing plant community at the site would be necessary. This community has been sampled and described, with the results provided in this report. Additionally, a "Reference Area", or a similar plant community located near the proposed disturbed area was studied. The Reference Area will not be disturbed during the course of the mining-related activities in the area, and can be used for comparisons now, as well as at the time of final revegetation to provide success standards then. The Reference Area was chosen for its similarities in geology, soils, slope, aspect, and plant community composition to the proposed construction area. In this study, the proposed new construction disturbance exists in an area that had previously been disturbed by historical mining activities, but attempts were made to choose the Reference Area to represent that native plant community that was present at the site prior to the previous disturbance. A sensitive plant species survey was also conducted for the sites.

The proposed breakout area is located in Pace Canyon, Carbon County, Utah. More specifically, the study area was located in Section 30, Township 13 South, Range 13 East (USGS Pine Canyon, 7.5 minute topographic quad).

METHODS

Methodologies used herein were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM). Quantitative and qualitative data were taken on the vegetation of the area proposed for disturbance and its Reference Area August 13-14, 2003.

Sampling Design and Transect/Quadrat Placement

Transect lines for vegetation sampling were placed randomly within the boundaries of the proposed disturbed area and Reference Area. The transect placement technique was employed with the goal to adequately sample a representative subset of the entire site. Once the transects were established, quadrat locations for sampling were chosen using random numbers from the transect lines with the objective to record data without preconceived bias.

As a side note, prior to initiation of the quantitative sampling *both* sides of the canyon road (areas that had been disturbed previously) were within the boundaries of the proposed new disturbance. Accordingly, sample transects were placed on both sides of the road, the data sets were lumped, and the means for each parameter were calculated. Since that time, it has been postulated that the disturbance may not include both sides of the road, but rather, it may be contained to only one side. There would be little or no significant differences in the data if each side of the road were separated; at least the differences would not likely change the cover or composition, but the raw

cover data have been included in the Appendix of this report so that these separations could be made if desired.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition, cover by species, and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows "A Utah Flora" (Welsh et al., 1993).

Woody Species Density

Density of woody plant species for the proposed disturbed and Reference Area were estimated using the point-quarter method. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual. The number of individuals per acre was the end results of the calculations.

Sample Size & Adequacy

Sampling adequacy for cover and density was attempted by using the formula given below.

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

where,

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

With the values used for "t" and "d"above, the goal was to meet sample adequacy with 80% confidence within a 10% deviation from the true mean. In areas where sample viability was unnaturally high (e.g. previous disturbance sites), these parameters may have been too rigorous.

Statistical Analyses

Student's t-tests were employed to compare the total living cover and total woody species density of the proposed disturbed area and its Reference Area.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been

submitted with this report.

Threatened & Endangered Plant Species

Prior to recording quantitative data on the plant communities, a sensitive plant species survey was conducted. To initiate the study, appropriate agencies were consulted (e.g. *Utah Natural Heritage Program*) and other sources were reviewed (sensitive species files at *Mt. Nebo Scientific, Inc.*) for potential plant species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the study area. The area was surveyed prior to initiation of the quantitative sampling as well as when implementing the sampling techniques.

Raw Data

The raw data for total cover, cover by species, composition and frequency have been summarized on a spreadsheet and were included in the Appendix of this report.

RESULTS

Proposed Disturbed Area

The mean total living cover of the vegetation for the proposed disturbed breakout site was estimated at 52.50%; 44.67% of this total was from the understory cover and 7.83% was

overstory (Table 1-A).

Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were the most common species in the overstory (Table 1-B). The most common understory species was a woody species, big sagebrush (*Artemisia tridentata*). Several other woody species were also present in the sample quadrats (see Table 1-B), but a host of forbs, nearly all of which were annual exotics or "weedy" species, were most common. The most common forb was poverty weed (*Iva axillaris*). Only one grass species, cheatgrass (*Bromus tectorum*), was present in the samples.

Species composition of the cover

Table 1: Total Cover (A), Cover by Species (B), and Composition (C) of the Proposed Disturbed Pinyon-Juniper Community of the Breakout Site of the Dugout Canyon Mine.

A. TOTAL COVER	Mean Percent	Standard Deviation	
Overstory (O)	7.83	19.86	
Understory (U)	44.67	21.45	
O+U	52.50	28.10	
Litter	15.37	17.29	
Bareground	21.50	18.50	
Rock	18.47	12.82	
B. COVER BY SPECIES			**Frequency**
OVERSTORY			
Acer grandidentatum	1.00	5.39	3.33
Juniperus osteosperma	2.00	7.92	6.67
Pinus edulis	3.33	13.06	6.67
Pseudotsuga menziesii	1.50	5.65	6.67
UNDERSTORY			
TREES & SHRUBS			
Acer glabrum	1.50	8.08	3.33
Acer grandidentatum	3.00	9.36	10.00
Artemisia tridentata	12.17	22.41	43.33
Juniperus osteosperma	2.00	6.40	10.00
Mahonia repens	0.57	2.16	6.67
Pinus edulis	1.23	5.49	6.67
Pseudotsuga menziesii	1.17	4.41	6.67
Sambucus caerulea	0.50	2.69	3.33
Symphoricarpos oreophilus	0.17	0.90	3.33
FORBS			
Artemisia dracunculus	1.57	5.64	13.33
Chenopodium fremontii	0.03	0.18	3.33
Convolvulus arvense	0.10	0.54	3.33
Cynoglossum officinale	0.83	2.18	16.67
Iva axillaris	10.70	16.03	40.00
Lappula occidentalis	0.17	0.90	3.33
Lepidium montanum	0.07	0.36	3.33
Malcomia africana	2.17	5.33	23.33
Polygonum aviculare	0.83	2.27	13.33
Ranunculus testiculatus	1.40	4.45	13.33
Solanum triflorum	0.13	0.72	3.33
GRASSES			
Bromus tectorum	4.37	4.79	60.00
C. COMPOSITION			
Woody Plants	44.25	41.80	
Forbs	44.99	38.17	
Grasses	10.75	12.41	

Table 2: Woody Species Density of the Proposed Disturbed Pinyon-Juniper Community of the Breakout Site of the Dugout Canyon Mine.

	Number/Acre
Acer glabrum	3.70
Acer grandidentatum	29.60
Amelanchier utahensis	3.70
Artemisia tridentata	318.16
Chrysothamnus nauseosus	11.10
Gutierrezia sarothrae	3.70
Juniperus osteosperma	11.10
Mahonia repens	11.10
Pinus edulis	22.20
Pseudotsuga menziesii	11.10
Sambucus caerulea	3.70
Symphoricarpos oreophilus	14.80
TOTAL	**443.95**

was nearly equally represented by woody and forb species at 44.25% and 44.99%, respectively, whereas grasses comprised 10.75% (Table 1-C).

The total woody species density, or the number of individuals per acre, was estimated at 444 (Table 2). Several species were present in the woody species measurements, but the most common species by far was big sagebrush.

Reference Area

The total living cover for the Reference Area was 57.43% (Table 3-A). Of that percentage, 26.00% was from overstory and 31.43% was from understory species. The most common overstory species were Douglas fir (*Pseudotsuga menziesii*), Utah juniper, and pinyon pine (Table 3-B). Like the area proposed for disturbance, the most common understory species was big sagebrush, but unlike the proposed disturbed site, most of the other species present in the sample quadrats were native, perennial species. Forbs were an important component in the cover and composition, but there were several native grasses in this community, the most common of which were Indian ricegrass (*Stipa hymenoides*) and Salina wildrye (*Elymus salinus*).

Species composition calculations shown on Table 3-C reveal that woody species comprised most of the living understory cover (61.16%), followed by grasses (33.36%), then forbs (5.47%).

The total number of woody species in the density measurements was estimated at 2,145 individuals per acre (Table 4). Big sagebrush had the greatest density, followed by pinyon pine and Utah juniper.

Threatened & Endangered Plant Species

State databases revealed only one potential sensitive species to be located in the vicinity of the proposed disturbed site. This plant was canyon vetch (*Hedysarum occidentale* var.

Table 3: Total Cover (A), Cover by Species (B), and Composition (C) of the Proposed Disturbed Pinyon-Juniper Reference Area of the Breakout Site of the Dugout Canyon Mine.

A. TOTAL COVER	Mean Percent	Standard Deviation	
Overstory (O)	26.00	31.53	
Understory (U)	31.43	12.75	
O + U	57.43	28.32	
Litter	22.70	19.10	
Bareground	13.43	10.39	
Rock	32.43	15.53	
B. COVER BY SPECIES			**Frequency**
OVERSTORY			
Juniperus osteosperma	8.50	19.59	16.67
Juniperus scopulorum	2.33	12.57	3.33
Pinus edulis	3.17	8.51	13.33
Pinus ponderosa	3.00	16.16	3.33
Pseudotsuga menziesii	9.00	23.32	13.33
UNDERSTORY			
TREES & SHRUBS			
Acer glabrum	0.57	2.30	6.67
Artemisia tridentata	9.63	12.15	53.33
Ephedra viridis	0.83	4.49	3.33
Juniperus osteosperma	2.33	5.28	20.00
Juniperus scopulorum	0.33	1.80	3.33
Pinus edulis	1.00	5.39	3.33
Pseudotsuga menziesii	3.17	8.31	20.00
Rhus aromatica	0.83	4.49	3.33
Symphoricarpos oreophilus	0.33	1.25	6.67
FORBS			
Artemisia dracunculus	1.23	4.77	10.00
Chaenactis douglasii	0.03	0.18	3.33
Erigeron engelmannii	0.10	0.54	3.33
Gayophytum ramosissimum	0.33	1.25	6.67
Lepidium montanum	0.23	0.96	6.67
Phlox longifolia	0.33	1.80	3.33
GRASSES			
Bromus tectorum	1.93	3.28	30.00
Elymus salinus	2.60	4.96	26.67
Hilaria jamesii	0.17	0.90	3.33
Poa fendleriana	1.23	3.18	16.67
Stipa hymenoides	4.20	6.17	40.00
C. COMPOSITION			
Woody Plants	61.16	30.65	
Forbs	5.47	11.11	
Grasses	33.36	29.78	

canone). The proposed disturbed area was surveyed in the field for canyon vetch (or any other unusual or sensitive plants). This survey was done prior to recording the quantitative data used to describe the major plant communities of the study areas. In addition, more searching for sensitive species was done during quantitative sampling of the areas.

Table 4: Woody Species Density of the Pinyon-Juniper Reference Area of the Breakout Site of the Dugout Canyon Mine.

	Number/Acre
Acer glabrum	71.51
Artemisia tridentata	1179.98
Ephedra viridis	35.76
Gutierrezia sarothrae	17.88
Juniperus scopulorum	17.88
Juniperus osteosperma	178.78
Opuntia polyacantha	17.88
Pinus edulis	375.45
Pinus ponderosa	17.88
Pseudotsuga menziesii	160.91
Rhus aromatica	17.88
Symphoricarpos oreophilus	53.64
TOTAL	**2145.41**

No rare, endemic, threatened, endangered or otherwise sensitive species were found in the area that was proposed for disturbance. Canyon vetch was located nearby, however, in the drainage near the riparian community of the Pace Canyon Creek – a community not planned to be disturbed or impacted by the breakout construction activities.

DISCUSSION

As mentioned previously, the area that has been proposed for disturbance due to the construction of the breakout portal is a site that has been disturbed by previous mining activities. The area was probably not reseeded upon termination of these activities so many "weedy" exotics have thrived in the area and were present in the sample quadrats. Additionally, woody species density was much lower in this disturbed community when compared to the native, undisturbed Reference Area chosen to represent future revegetation standards at the breakout area. The differences

were statistically significant (Table 5-B).

Although statistical comparison of the total living cover (which included overstory and understory cover) revealed no significant differences when the proposed disturbed area was compared to the Reference Area (Table 5-A), the relative proportions of overstory and understory of the two communities were quite different.

Table 5: A statistical comparison (Student's t-tests) of the total living cover and woody species density between the proposed disturbed site and the Reference Area of the Breakout Site of the Dugout Mine.

	$\bar{x}$	s	n	t	df	SL
A. Total Living Cover						
Proposed Disturbed:	52.50	28.10	30			
Reference Area:	57.43	28.32	30			
t-test				-0.677	58	N.S.
B. Woody Species Density						
Proposed Disturbed:	443.95	586.58	30			
Reference Area:	2145.41	1395.61	30			
t-test				6.156	58	p<.001

$\bar{x}$ = mean
s = standard deviation
n = sample size
t = Student's t-value
df = degrees of freedom
SL= Significance Level

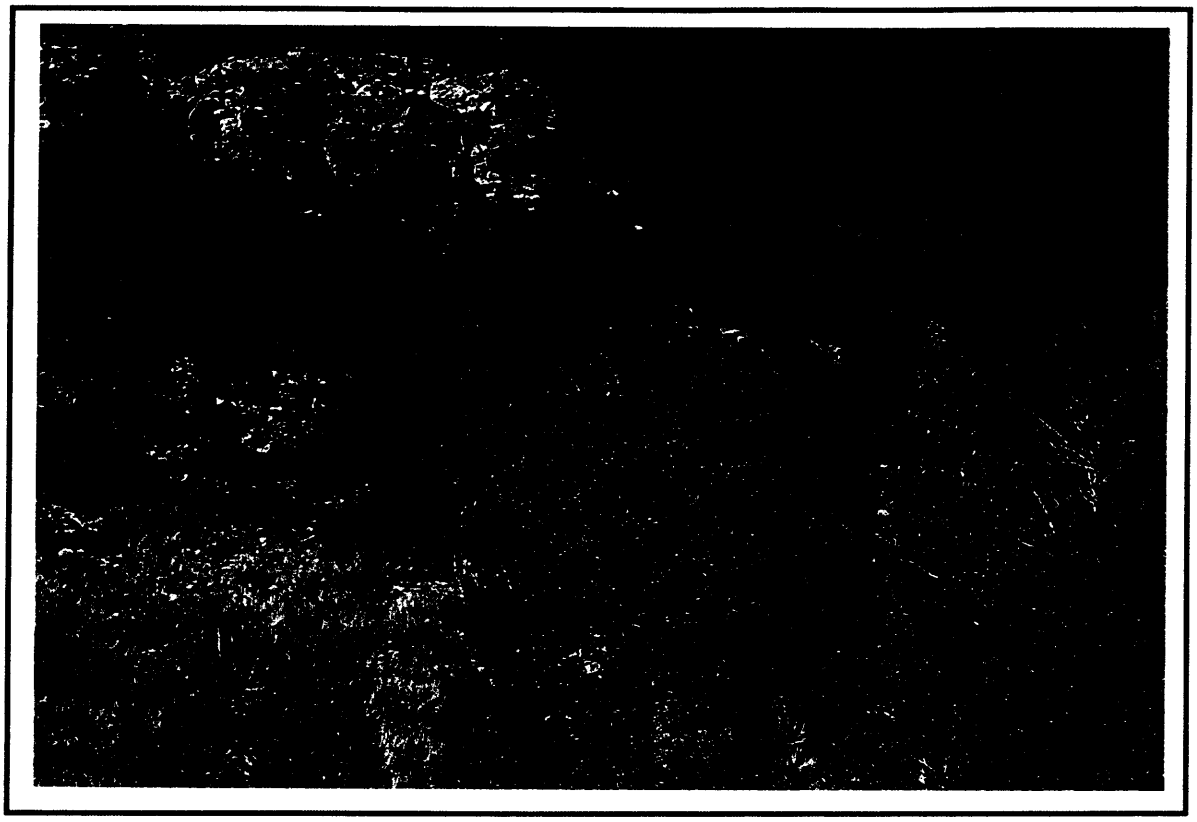
The above paragraphs in this section were written only to reiterate the fact that the proposed disturbed area is the site that had been previously disturbed by historical mining activities, and the plant community established here reflects these perturbations. Furthermore, when compared to the native, undisturbed plant community chosen to represent future standards for revegetation, some of these differences are disclosed. Although meeting the standards dictated by the Reference Area at the time of final reclamation would not be considered unreasonably stringent, some consideration by the regulatory agencies regarding the previous

history of the proposed disturbed area and the condition of the existing plant community at the time of its re-disturbance, may be warranted.

COLOR PHOTOGRAPHS

Breakout Area. Proposed Disturbed Pinyon-Juniper Community (1 of 2)

Breakout Area. Proposed Disturbed Pinyon-Juniper Community (2 of 2)



Breakout Area. Pinyon-Juniper Reference Area (1 of 2)

Breakout Area. Pinyon-Juniper Reference Area (2 of 2)

APPENDIX

(Raw Data)

CANYON FUEL
Dugout - Breakout
Previously Disturbed PJ
Exposure: 1 - 20 deg
Slope: S
Sample Date: 13 Aug 03

1 thru 15 = South Side of Road

	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Acer grandidentatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY							
TREES & SHRUBS							
Acer glabrum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acer grandidentatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	0.00	0.00	8.00	25.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mahonia repens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sambucus caerulea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Symphoricarpos oreophilus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Artemisia dracunculus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chenopodium fremontii	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Convolvulus arvense	0.00	0.00	0.00	0.00	0.00	0.00	3.00
Cynoglossum officinale	0.00	0.00	0.00	10.00	0.00	0.00	5.00
Iva axillaris	0.00	0.00	0.00	0.00	0.00	0.00	15.00
Lappula occidentalis	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Lepidium montanum	0.00	0.00	0.00	0.00	2.00	0.00	0.00
Malcomia africana	0.00	0.00	0.00	0.00	5.00	5.00	22.00
Polygonum aviculare	0.00	0.00	10.00	5.00	5.00	0.00	0.00
Ranunculus testiculatus	0.00	2.00	20.00	15.00	0.00	0.00	0.00
Solanum triflorum	4.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Bromus tectorum	0.00	8.00	0.00	5.00	5.00	5.00	0.00
COVER							
Overstory	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Understory	5.00	15.00	30.00	35.00	25.00	35.00	45.00
Litter	1.00	20.00	15.00	10.00	5.00	5.00	3.00
Bareground	65.00	45.00	30.00	40.00	45.00	10.00	20.00
Rock	29.00	20.00	25.00	15.00	25.00	50.00	32.00
% COMPOSITION							
Woody Plants	0.00	0.00	0.00	0.00	32.00	71.43	0.00
Forbs	100.00	46.67	100.00	85.71	48.00	14.29	100.00
Grasses	0.00	53.33	0.00	14.29	20.00	14.29	0.00
Overstory + Understory	5.00	15.00	30.00	35.00	25.00	35.00	45.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	0.00
3.00	85.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	30.00	15.00	45.00	35.00	5.00	0.00	0.00	35.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	5.00	5.00	0.00	0.00	3.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	20.00	5.00	10.00	5.00	2.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
30.00	85.00	55.00	25.00	55.00	45.00	15.00	85.00	10.00	75.00
3.00	2.00	5.00	2.00	5.00	5.00	5.00	2.00	30.00	15.00
35.00	3.00	25.00	50.00	25.00	30.00	60.00	3.00	5.00	2.00
32.00	10.00	15.00	23.00	15.00	20.00	20.00	10.00	55.00	8.00
10.00	100.00	0.00	0.00	0.00	0.00	33.33	100.00	100.00	33.33
90.00	0.00	63.64	80.00	81.82	88.89	53.33	0.00	0.00	53.33
0.00	0.00	36.36	20.00	18.18	11.11	13.33	0.00	0.00	13.33
30.00	85.00	55.00	25.00	55.00	45.00	15.00	85.00	10.00	95.00

16 thru 30 = North Side of Road

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	35.00	65.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	7.00	0.00	40.00	0.00	0.00	20.00	2.00	60.00	30.00
0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	7.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	30.00	2.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
10.00	0.00	58.00	20.00	0.00	0.00	30.00	23.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	3.00	5.00	5.00	10.00	0.00	10.00	10.00	10.00	3.00
0.00	0.00	0.00	0.00	75.00	65.00	0.00	0.00	0.00	0.00
80.00	40.00	65.00	65.00	35.00	30.00	60.00	50.00	70.00	50.00
5.00	55.00	2.00	5.00	63.00	43.00	5.00	5.00	20.00	20.00
2.00	4.00	13.00	20.00	1.00	2.00	30.00	35.00	1.00	10.00
13.00	1.00	20.00	10.00	1.00	25.00	5.00	10.00	9.00	20.00
87.50	17.50	0.00	61.54	71.43	100.00	33.33	4.00	85.71	94.00
12.50	75.00	92.31	30.77	0.00	0.00	50.00	76.00	0.00	0.00
0.00	7.50	7.69	7.69	28.57	0.00	16.67	20.00	14.29	6.00
80.00	40.00	65.00	65.00	110.00	95.00	60.00	50.00	70.00	50.00

CANYON FUEL
Dugout - Breakout
Previously Disturbed PJ
Exposure: 1 - 20 deg
Slope: S
Sample Date: 13 Aug 03

28.00	29.00	30.00	Mean	SDev	Freq	
						OVERSTORY
0.00	0.00	30.00	1.00	5.39	3.33	*Acer grandidentatum*
0.00	0.00	0.00	2.00	7.92	6.67	*Juniperus osteosperma*
0.00	0.00	0.00	3.33	13.06	6.67	*Pinus edulis*
0.00	20.00	25.00	1.50	5.65	6.67	*Pseudotsuga menziesii*
						UNDERSTORY
						TREES & SHRUBS
0.00	0.00	0.00	1.50	8.08	3.33	*Acer glabrum*
20.00	0.00	30.00	3.00	9.36	10.00	*Acer grandidentatum*
10.00	0.00	0.00	12.17	22.41	43.33	*Artemisia tridentata*
0.00	0.00	0.00	2.00	6.40	10.00	*Juniperus osteosperma*
7.00	0.00	0.00	0.57	2.16	6.67	*Mahonia repens*
0.00	0.00	0.00	1.23	5.49	6.67	*Pinus edulis*
0.00	15.00	20.00	1.17	4.41	6.67	*Pseudotsuga menziesii*
0.00	15.00	0.00	0.50	2.69	3.33	*Sambucus caerulea*
0.00	5.00	0.00	0.17	0.90	3.33	*Symphoricarpos oreophilus*
						FORBS
0.00	0.00	0.00	1.57	5.64	13.33	*Artemisia dracunculus*
0.00	0.00	0.00	0.03	0.18	3.33	*Chenopodium fremontii*
0.00	0.00	0.00	0.10	0.54	3.33	*Convolvulus arvense*
3.00	0.00	0.00	0.83	2.18	16.67	*Cynoglossum officinale*
0.00	0.00	0.00	10.70	16.03	40.00	*Iva axillaris*
0.00	0.00	0.00	0.17	0.90	3.33	*Lappula occidentalis*
0.00	0.00	0.00	0.07	0.36	3.33	*Lepidium montanum*
0.00	0.00	0.00	2.17	5.33	23.33	*Malcomia africana*
0.00	0.00	0.00	0.83	2.27	13.33	*Polygonum aviculare*
0.00	0.00	0.00	1.40	4.45	13.33	*Ranunculus testiculatus*
0.00	0.00	0.00	0.13	0.72	3.33	*Solanum triflorum*
						GRASSES
0.00	0.00	0.00	4.37	4.79	60.00	*Bromus tectorum*
						COVER
0.00	20.00	55.00	7.83	19.86		Overstory
40.00	35.00	50.00	44.67	21.45		Understory
45.00	15.00	45.00	15.37	17.29		Litter
10.00	20.00	4.00	21.50	18.50		Bareground
5.00	30.00	1.00	18.47	12.82		Rock
						% COMPOSITION
92.50	100.00	100.00	44.25	41.80		Woody Plants
7.50	0.00	0.00	44.99	38.17		Forbs
0.00	0.00	0.00	10.75	12.41		Grasses
40.00	55.00	105.00	52.50	28.10		Overstory + Understory

CANYON FUEL
Dugout - Breakout
PJ/Sagebrush Reference Area
Exposure: 30 deg
Slope: E

Sample Date: 13 Aug 03	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Juniperus osteosperma	0.00	0.00	0.00	0.00	55.00	0.00	0.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	20.00	0.00	0.00
Pinus ponderosa	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY							
TREES & SHRUBS							
Acer glabrum	0.00	12.00	0.00	0.00	0.00	0.00	0.00
Artemisia tridentata	20.00	1.00	40.00	20.00	0.00	10.00	30.00
Ephedra viridis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	5.00	20.00	15.00	0.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rhus aromatica	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Symphoricarpos oreophilus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Artemisia dracunculus	0.00	0.00	0.00	0.00	0.00	0.00	10.00
Chaenactis douglasii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Erigeron engelmannii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gayophytum ramosissimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lepidium montanum	2.00	0.00	0.00	0.00	0.00	0.00	0.00
Phlox longifolia	0.00	0.00	10.00	0.00	0.00	0.00	0.00
GRASSES							
Bromus tectorum	3.00	5.00	0.00	0.00	0.00	10.00	10.00
Elymus salinus	0.00	7.00	0.00	5.00	0.00	0.00	0.00
Hilaria jamesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Poa fendleriana	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	0.00	5.00	0.00	10.00	10.00
COVER							
Overstory	0.00	0.00	0.00	0.00	75.00	0.00	0.00
Understory	25.00	25.00	50.00	40.00	20.00	45.00	60.00
Litter	15.00	5.00	20.00	25.00	24.00	15.00	5.00
Bareground	15.00	45.00	5.00	15.00	1.00	10.00	20.00
Rock	45.00	25.00	25.00	20.00	55.00	30.00	15.00
% COMPOSITION							
Woody Plants	80.00	52.00	80.00	62.50	100.00	55.56	50.00
Forbs	8.00	0.00	20.00	0.00	0.00	0.00	16.67
Grasses	12.00	48.00	0.00	37.50	0.00	44.44	33.33
Overstory + Understory	25.00	25.00	50.00	40.00	95.00	45.00	60.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	40.00	60.00	35.00	0.00	0.00	0.00
0.00	0.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.00
0.00	0.00	0.00	75.00	0.00	0.00	0.00	0.00	65.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	15.00	5.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	35.00	0.00	0.00	0.00	5.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00
25.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	10.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	13.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	15.00	0.00	5.00	5.00	0.00	0.00
5.00	15.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	70.00	75.00	40.00	60.00	35.00	0.00	65.00	90.00
45.00	45.00	20.00	35.00	15.00	5.00	20.00	40.00	20.00	25.00
5.00	25.00	25.00	20.00	40.00	40.00	10.00	20.00	60.00	65.00
30.00	5.00	25.00	20.00	5.00	5.00	10.00	15.00	1.00	1.00
20.00	25.00	30.00	25.00	40.00	50.00	60.00	25.00	19.00	9.00
22.22	0.00	50.00	100.00	0.00	100.00	75.00	62.50	100.00	100.00
55.56	4.44	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.22	95.56	35.00	0.00	100.00	0.00	25.00	37.50	0.00	0.00
45.00	70.00	90.00	110.00	55.00	65.00	55.00	40.00	85.00	115.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	0.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	15.00	0.00	0.00	0.00	35.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	15.00	0.00	8.00	10.00	0.00	15.00	0.00	25.00	30.00
0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
15.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	10.00	0.00	20.00	14.00	20.00	5.00	0.00	0.00
0.00	0.00	65.00	15.00	0.00	0.00	0.00	35.00	0.00	0.00
25.00	50.00	20.00	15.00	30.00	15.00	40.00	35.00	35.00	30.00
5.00	10.00	65.00	35.00	5.00	5.00	5.00	50.00	5.00	2.00
10.00	10.00	5.00	15.00	15.00	20.00	10.00	5.00	35.00	15.00
60.00	30.00	10.00	35.00	50.00	60.00	45.00	10.00	25.00	53.00
20.00	80.00	50.00	53.33	33.33	0.00	37.50	85.71	71.43	100.00
0.00	0.00	0.00	0.00	0.00	6.67	12.50	0.00	14.29	0.00
80.00	20.00	50.00	46.67	66.67	93.33	50.00	14.29	14.29	0.00
25.00	50.00	85.00	30.00	30.00	15.00	40.00	70.00	35.00	30.00

CANYON FUEL
Dugout - Breakout
PJ/Sagebrush Reference Area
Exposure: 30 deg
Slope: E
Sample Date: 13 Aug 03

28.00	29.00	30.00	Mean	SDev	Freq	
						OVERSTORY
0.00	0.00	0.00	8.50	19.59	16.67	*Juniperus osteosperma*
0.00	0.00	0.00	2.33	12.57	3.33	*Juniperus scopulorum*
0.00	0.00	0.00	3.17	8.51	13.33	*Pinus edulis*
0.00	0.00	0.00	3.00	16.16	3.33	*Pinus ponderosa*
0.00	50.00	80.00	9.00	23.32	13.33	*Pseudotsuga menziesii*
						UNDERSTORY
						TREES & SHRUBS
0.00	0.00	0.00	0.57	2.30	6.67	*Acer glabrum*
20.00	35.00	0.00	9.63	12.15	53.33	*Artemisia tridentata*
0.00	0.00	0.00	0.83	4.49	3.33	*Ephedra viridis*
0.00	0.00	0.00	2.33	5.28	20.00	*Juniperus osteosperma*
0.00	0.00	0.00	0.33	1.80	3.33	*Juniperus scopulorum*
0.00	0.00	0.00	1.00	5.39	3.33	*Pinus edulis*
0.00	0.00	25.00	3.17	8.31	20.00	*Pseudotsuga menziesii*
0.00	0.00	0.00	0.83	4.49	3.33	*Rhus aromatica*
0.00	0.00	0.00	0.33	1.25	6.67	*Symphoricarpos oreophilus*
						FORBS
0.00	0.00	0.00	1.23	4.77	10.00	*Artemisia dracunculus*
0.00	0.00	0.00	0.03	0.18	3.33	*Chaenactis douglasii*
0.00	0.00	0.00	0.10	0.54	3.33	*Erigeron engelmannii*
0.00	0.00	0.00	0.33	1.25	6.67	*Gayophytum ramosissimum*
0.00	5.00	0.00	0.23	0.96	6.67	*Lepidium montanum*
0.00	0.00	0.00	0.33	1.80	3.33	*Phlox longifolia*
						GRASSES
0.00	0.00	5.00	1.93	3.28	30.00	*Bromus tectorum*
18.00	5.00	0.00	2.60	4.96	26.67	*Elymus salinus*
0.00	0.00	0.00	0.17	0.90	3.33	*Hilaria jamesii*
0.00	0.00	0.00	1.23	3.18	16.67	*Poa fendleriana*
0.00	0.00	0.00	4.20	6.17	40.00	*Stipa hymenoides*
						COVER
0.00	50.00	80.00	26.00	31.53		Overstory
38.00	45.00	30.00	31.43	12.75		Understory
0.00	30.00	45.00	22.70	19.10		Litter
25.00	5.00	5.00	13.43	10.39		Bareground
37.00	20.00	20.00	32.43	15.53		Rock
						% COMPOSITION
52.63	77.78	83.33	61.16	30.65		Woody Plants
0.00	11.11	0.00	5.47	11.11		Forbs
47.37	11.11	16.67	33.36	29.78		Grasses
38.00	95.00	110.00	57.43	28.32		Overstory + Understory

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Price Field Office
125 South 600 West
Price, Utah 84501

3482
(UT-070)

NOV - 5 2003

NOV - 7 2003

Ark Land Company
c/o Canyon Fuel Co., LLC
Dugout Mines
PO Box 1029
Wellington, Utah 84542

Dear Mr. Stephenson:

Our decision is to grant an exploration plan (submitted 09/18/03) on Federal coal lease UTU-07064 to Ark Land Company Dugout Mine to access and drill seven coal exploration holes (A, B, C, D, E, F, G) subject to the following conditions:

1) The enclosed Bureau of Land Management (BLM) drilling stipulations will be followed.

2) Your current bonding is sufficient for this exploration plan.

If you have any questions regarding this matter, please contact Don Stephens of our staff at 435-636-3608.

Sincerely,

Patrick Gubbins
Field Manager

Enclosure
BLM Stipulations (3 pp)

cc: UT-92313, J. Kohler, Utah State Office (w/Enclosures)
UT-92413, R. Lopez, Utah State Office (w/oEnclosures)
Pamela Grubaugh-Littig (UDOGM) (w/Enclosures)
Division of Oil, Gas and Mining
1594 West North Temple Street
P. O. Box 145801
Salt Lake City, Utah 84114-5801

Canyon Fuel Company, LLC
Pace Canyon Coal Exploration

Environmental Assessment UT-070-2003-55

October 2003

Prepared By
USDI Bureau of Land Management
Price Field Office
Price, Utah

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Canyon Fuel Company, LLC
Pace Canyon Coal Exploration
Environmental Assessment UT-070-2003-55

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1.0 INTRODUCTION AND PURPOSE AND NEED

1.1 Purpose and Need

Ark Land Company (a subsidiary of Arch Coal, Inc.) on behalf of Canyon Fuel Company, LLC (CFC) has filed a Notice of Intention (NOI) to conduct coal exploration for the existing Dugout Canyon Mine in Carbon County, Utah. This exploration would be conducted in accordance with BLM Regulations 43 CFR Part 3482 and State of Utah Coal Mining Regulations, R645-200 through R645-203. The proposed exploration area covers federal lands overlying the Federal U-07064 coal lease. CFC proposes to complete up to seven exploration drill holes to evaluate the reserves and quality of coal seams within the Blackhawk Formation.

1.2 Authorizing Actions and Permits

1.2.1 Bureau of Land Management Land Use Plan Conformance The Proposed Action is subject to the Bureau of Land Management (BLM) Price Field Office Price River Management Framework Plan (MFP, 1984). The mineral objective decision (M-1) of the MFP pertaining to the replacement of current oil and gas with the production of other domestic energy minerals states:

> *"Allow and encourage development of those leaseable minerals known to occur within the planning area in accordance with current laws and regulations so as to aid in filling the local and national energy requirements."*

1.2.2 Relationship with Other Statutes, Plans and Required Permits Various Federal, State, and local statutes, permits, easements and rights-of-way (ROW) may be required for actions associated with the proposed development. A UPDES Storm Water Permit consisting of a Stormwater Pollution Prevention Plan (SWPPP) would be required if the total disturbance exceeds one acre.

1.3 Issues Identified for Analysis

Environmental issues were identified for the Proposed Action utilizing an interdisciplinary process during a BLM scoping meeting. Issues associated with the natural resources, resource values, natural processes, and components of the human environment were derived during the meeting and were limited due to either minor or no additional disturbance resulting from the Proposed Action.

- Soils

- Vegetation
- Threatened, Endangered and Sensitive Species*
- Water Quality*
- Cultural Concerns*

1.4 Issues Considered and Dismissed

The following environmental elements were reviewed to determine the need to include them for analysis in this document. It has been determined that these elements would not be affected by the Proposed Action and will not be discussed further in the document:

- Air Quality* No effects have been identified.

- Areas of Critical Environmental Concern (ACECs)* No ACECs are present within the Proposed Action area.

- Environmental Justice* No minority or economically disadvantaged communities or populations have been identified which could be affected by the Proposed Action.

- Hazardous and Solid Wastes* Actions taken by CFC under the coal exploration program (CEP) in association with similar coal exploration actions taken, would be satisfactory to address this issue. Hazardous and solid wastes would be contained by berms being constructed around drill sites to contain any potential spills. All spills of polluting materials would be removed from the area and properly disposed in appropriate facilities. Refer to Appendix A.

- Native American Religious Concerns* No such concerns have been identified during cultural issue evaluation.

- Non-native and Invasive Species* No such concerns have been identified within the Proposed Action area.

- Prime and Unique Farmlands* No such areas exist within the Proposed Action area.

- Native American Trust Resources There are no Native American Trust Lands within the Proposed Area.

- Rangeland Standards The Fundamentals of Rangeland Health (43 CFR 4180) including watersheds, condition, and water quality have not been analyzed. The Proposed Action may affect these standards and guidelines or the livestock grazing.

However, the effect is expected to be temporary and minor.

- Wild and Scenic Rivers* No such designations exist within the area of the Proposed Action nor are there any rivers eligible for such designation in the area.

- Wilderness* No such designations exist within the area of the Proposed Action.

- Floodplains* No action will occur nor will any disturbance take place within a floodplain.

- Wetlands and Riparian* No wetland and/or riparian areas would be impacted as a result of the Proposed Project.

*Critical Elements of the Human Environment

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

2.1.1 Alternative A – No Action The proposed coal exploration within this portion of the Pace Canyon area would not be granted and the action would not occur as described.

2.1.2 Alternative B – Proposed Action The Proposed Action by CFC would be to drill three exploratory drill holes on BLM land, overlying Federal coal lease U-07064. Depending upon information gathered during this exploration project, an additional four holes could be drilled in this area. This information is needed to accurately locate structural control data on the Gilson Coal Seam. The Dugout Canyon Mine would use this information for determining the feasibility of a ventilation breakout. The Proposed Action can be seen on Plate 1 and 2. Past mining and logging activities have previously disturbed most of the project area. Drilling pads, erosion control structures, and mud pits would be constructed on sites prior to drilling activities. Drilling operations would be completed in the fall of 2003. The proposed drilling sites are in Carbon County, Utah. The specific exploration sites are shown in Table 1.

TABLE 1
Site Identification, Drilling Date, Surface/Mineral Rights, and Locations/Sections

Hole ID	Year Drilled	Surface/Mineral Rights Status	Location of Drill Sites and Seismic Activity
A	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
B	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
C	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
D	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
E	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
F	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30
G	2003	Federal/Federal	T. 13 S., R. 13 E., Section 30

An improved, gravel road through Clark's Valley, herein called the Clark Valley Road would be used to access the drill sites. From the Clark Valley road, a private dirt/gravel road (Pace Canyon Road) would be used to access the site. These two roads would provide the main access for all the drilling activities. All of the access roads in the project area are located on private surface lands. Erosion control structures, utilizing the State of Utah and BLM's Best Management Practices (BMPs) would be used in sensitive areas to prevent runoff erosion.

Sites A, C, and D are located along Pace Canyon Road. Site B is located along an abandoned segment of the Pace Canyon Road that may need some minor upgrading. Site E is located within a flat disturbed area immediately east of Pace Canyon Road. Site F is topographically above Pace Canyon Road further northward from the site. To drill site F approximately 165 feet of pre-existing road would need to be upgraded. Site G is also topographically above the Pace Canyon Road and approximately 80 feet of new road would need to be constructed.

The general method to be followed during the drill hole exploration, reclamation, and abandonment would be: 1) repair the roads where needed and prepare the drill site pad, 2) drill, log, and plug the exploration drill hole, 3) reclaim the drill site pad and access route. No blasting will be done for road building or repair. Repair of roads would include grading to fill rutted areas and hauling of gravel to fill rough areas on bedrock ledges. Road repair and drill site preparation and reclamation would be done with a dozer and a road grader. Equipment operators and geologists would use pickup trucks or SUVs for transportation.

Except for drill sites F and G, the sites are located on flat ground adjacent to the Pace Canyon Road and require minimal disturbance. Due to the small drill pad size, the Pace Canyon Road would still be adequate to handle the light traffic load in this area. Site F would require upgrading of a pre-existing road and some leveling for the drill site pad. Site G would require a short segment of new road. Shallow earthen pits may need to be dug to contain cuttings and drill fluids or serve to hold portable pits (livestock troughs). When mud pits cannot be constructed, livestock troughs would be used or the drilling mud, foam, and/or cuttings would be hauled off and disposed of properly.

Core drilling would involve one truck-mounted 1,000 foot rated core drill, one 3,000 gallon water truck, one supply and drill pipe trailer, three pickup trucks, a geophysical logging truck, and one covered trailer. The drilling procedure for the exploration holes would be either continuously core to total depth, rotary drilling and spot coring of selected zones, or a combination of both. Surface casing may be needed to segregate the unconsolidated material that overlies the Blackhawk Formation. The holes would be shallow and less than 100 feet each.

Water would be hauled from the Right Fork of Dugout Creek and/or Pace Creek to drill sites (Plate I). The supply trailer would carry drill steels, coring equipment, drilling additives, cutting and welding equipment, and other supplies. The drillers would use two pickup trucks for personnel, fuel, and supplies and the dirt contractor would use one pickup truck. The logging contractor would use a single axle one-ton rated truck. The company representative and geological consultant would also use pickup trucks or SUVs for transportation.

Earth excavation, if necessary would mostly be done for the drill sites using a dozer or backhoe and road grader. Excavation, if necessary, would include grubbing, removal and separate storage of the soil A horizon and, if needed, removal and separate storage of material below the soil A horizon to make a level drill site. The only material disposed of at the drill sites will be cuttings, possible core and any drilling foam and/or mud which would be placed in the mud pits.

The exploration drill holes would be plugged with a cement or cement/bentonite slurry to their full depth. The completion method includes pulling surface casing when possible; but when not possible, cutting it flush with the ground, then pumping the cement/bentonite slurry through the drill pipe starting at the bottom of the hole. Plugging would then be done in stages by tripping-out of the hole with each joint. The process would be repeated to the surface. The plugged hole would be flush with the ground surface. The BLM would be notified of when plugging will start. The potential for water pollution would be minimized by keeping pollutants away from the drill hole and in their containers. Materials used during drilling operations would be selected to be as non-polluting as possible. Berms would be constructed around the drill hole sites to contain any potential spills. All spills of polluting materials would be removed from the area and properly disposed of. See Appendix A for the Fuel/Oil Spill Plan.

All the drill holes may range from a nominal 3 3/16 inches to 10 inches in diameter, depending on the drilling method. The estimated depths of the proposed drill holes and other drill hole information is given in Table 2. Drill site acreage is estimated for a 70 foot by 70 foot pad. It is anticipated that the pads will be small in size and adjacent to the road. The road may serve as part of the drilling pad but road access would be maintained around the drilling rig. Access routes are estimated to be 14 feet wide. An estimated timetable for all exploration related activities is given in Table 3.

TABLE 2
Estimated Drilling Depths and Associated Disturbance

Drill Site	Total Depth (ft)	Disturbed Acreage		
		Drill Site	Access Route	Total
A	50	0.12	0.00	0.12
B	50	0.12	0.00	0.12
C	50	0.12	0.00	0.12
D	50	0.12	0.00	0.12
E	50	0.12	0.00	0.12
F	50	0.12	0.05	0.17
G	50	0.12	0.05	0.17
TOTAL	350	0.84	0.10	0.94

TABLE 3
Estimated Exploration Activities

Event	Week 1	Week 2	Week 3	Week 4
Prepare Access/Sites				
Core Drilling				
Reclamation				

The only coal removed during exploration activities would be cores. Assuming a core diameter of three inches and an average thickness of seven feet for the Gilson Seam, an estimated 85 pounds of coal would be removed.

Reclamation activities would closely follow the completion of each hole and be conducted in accordance with the applicable requirements set forth by the State of Utah Coal Mining Regulations (R645-202), the landowner, and the BLM. Upon completion of drilling activities at a given site, all debris, and drilling related equipment would be removed from the site. When the mud pit is sufficiently dry, it would be backfilled with stored subsoil material and compacted to minimize settling. A backhoe or a bulldozer would redistribute the subsoil and topsoil material on and around drill pads to achieve approximate original contour. Straw bales/silt fences would be removed to facilitate reclamation of the drill sites. Entire drill pad areas, excluding existing road surfaces that would be used as part of the pad, would be significantly roughened and reseeded shortly thereafter using the seed mix that has been approved for use by the UDOGM, and the BLM for reclamation. The suggested mix that has been approved is described in Table 4.

Shortly after the seeding of disturbed areas, the seed, in most cases, would be lightly buried and protected by raking the reseeded surface area. Based upon site-specific conditions, however, clean straw or hay mulch would be applied at the rate of 2,000 pounds per acre $^{-1}$, where warranted, to provide better protection from erosion.

The drill pad and access road reclamation procedure outlined above would apply only to those areas disturbed as a result of this exploration. Preexisting roads would be left in a condition equal to or better than that observed on CFC's entry into the area.

TABLE 4
Suggested Seed Mix

Common Name	Scientific Name	Pounds PLS Acre $^{-1}$
Western wheatgrass	*Agropyron smithii*	2.00
Bluebunch wheatgrass	*Agropyron spicatum*	2.00
Indian ricegrass	*Oryzopsis hymenoides*	1.00
Intermediate wheatgrass	*Agropyron intermedium*	2.00
Fairway wheatgrass	*Agropyron cristatum*	1.00
Northern sweetvetch	*Hedysarum boreal*	1.00
Small barnet	*Sanguisorba minor*	1.00
Fourwing saltbrush	*Atriplex canescens*	1.00
Sandberg bluegrass	*Poa secunda**	0.50
Pacific aster	*Aster chilensis-adscendens**	0.25
TOTAL		11.75

*Included if available

3.0 AFFECTED ENVIRONMENT

3.1 General Setting

The exploration area is located in the Book Cliffs physiographic area. The elevation of the proposed exploration area is approximately 7,000 feet. The seven proposed drilling sites are mainly located on previously disturbed sites or on existing roads. This area has been heavily logged many years ago and again in the last five years. The primary vegetation types consist of mountain shrubs, sagebrush-grass, pinyon-juniper.

3.2 Soils

Soils in the project area have been mapped at the Order 3 intensity level by the Soil Conservation Service, (now the Natural Resource Conservation Service) (NRCS) as part of the Soil Survey of the Carbon Area, Utah, 1988. An on-site inspection and evaluation of the soil resources at each drill site was also conducted on September 24, 2003.

Soils - Drill hole locations A, B, C, D, E, and F are all on currently disturbed sites from previous mining and exploration activities and road construction. Only drill hole G would involve soils that are currently undisturbed.

Soil materials consist of stony and cobbly colluvium derived mostly from sandstone and siltstone. Coal is intermingled in the soils throughout the site. The texture of the soil matrix is generally loam but includes spots of silt loam and sandy loam.

The project area is located near the canyon bottom at the transition of soil map unit 96-Rock outcrop-Rubble and –Travessillia complex and soil map unit 21 – Croydon loam, 8 to 30 percent slopes as identified by the Natural Resources Conservation Service in the Soil Survey of the Carbon Area, Utah.

The short section of access road to drill hole G has soils that appear to be similar to the Datino soil series (loamy-skeletal, mixed, superactive, frigid Entic Haplustolls). The surface soil, to a depth of about 10 to 14 inches is very dark grayish-brown (moist) cobbly loam boardering on silt loam and very fine sandy loam. Subsoils are dark yellowish-brown (moist) very cobbly to very stony loam. The soils are well drained, permeability is moderate, and the hazard of erosion by water is moderate. They are neutral to moderately alkaline in reaction.

3.3 Vegetation

The Proposed Action lies within a previously disturbed section of Pace Canyon. The dominant vegetation consists of Pinyon pine, Rocky Mountain juniper, Utah juniper, and Bigtooth maple. Small amounts of Douglas-fir are starting to establish in the area. Dominant shrub vegetation consists of Big Sage Brush and Snowberry. Other shrubs located in isolated amounts consist of serviceberry, Oregon grape, red elderberry, and cliff-rose. Forbs consist mostly of the weed Houndstongue with some lesser amounts of fleabane daisy and penstemons scattered around the proposed area. Cheat grass and Indian rice grass make up the dominant grasses. (Refer to Appendix B for scientific name list)

3.4 Wildlife Resources and Threatened, Endangered, and Sensitive Species

A variety of wildlife and potential threatened, endangered, and sensitive (TES) species habitat does exist in the Proposed Action area. The Proposed Action would be in the Anthro/Range Creek game management Unit 11. Presently the game management objective for deer in this unit is 8,500 animals and at last count there were 4,300. Elk objective for this unit is 1,700 animals and at last count the elk were above objective at 1,950. Mule deer and elk critical summer range are present in the Proposed Action area (Plate 1). Raptor species most common in area include golden eagle, red-tailed hawk, and prairie falcon (Plate 1). There are no active nesting sites near the Proposed Action area.

In accordance with the United States Fish and Wildlife Service's (USFWS) protocols, an inventory for the presence of threatened, endangered, and sensitive fauna and floral species was conducted on August 13, 14 and September 29, 2003. Loggerhead shrike, burrowing owl, Northern Goshawk, Despain footcactus, Wright fishhook cactus and Creutzfeldt cryptantha and Neo-tropical migratory birds where the sensitive species of concern within the area. A thorough search of all seven well sites and associated access roads did not reveal the presence of these species (Appendix C).

Mexican spotted owl (MSO) inventory work on the project area was conducted in 2001 and 2002 following USFWS protocol. Although some suitable habitat did exist within the project area, a thorough search did not reveal the presence of any Mexican spotted owls. The project area does not contain any designated critical habitat for MSO. Reviewing of the 97 and 2000 model did show some small areas with nesting/roosting potential. Dr. David Willey (Willey 2000) was contracted to evaluate MSO habitat in the area. Dr. Willey concluded that even though there were small areas that had potential for nesting/roosting, these areas were considered marginal for MSO.

3.5 Hydrology

The Proposed Action is located in Pace Canyon. Pace Creek at the Proposed Action area would be classified as an intermittent stream due to its past sporadic flow. Pace Creek is fed by springs located upstream. Presently, Pace Creek is not flowing near the project area. The continuing five-year drought has greatly reduced all surface flows in the area.

Ground water at the Dugout Canyon Mine, due to geologic conditions, consists mainly of perched water above the coal seams. This condition is found in other mines located in the Wasatch Plateau and Book Cliffs areas. This perched water at the Dugout Canyon Mine is in the Blackhawk Formation and is localized and not part of a regional aquifer.

3.6 Cultural Concerns

An archaeological inventory of the Proposed Action area was conducted by SENCO-PHENIX Archaeological Consulting Services in 2001. This site was also surveyed by AERC in 1980. Only one cultural site (historic coal loadout 42CB292) was located by AERC.

The area has been heavily logged since the original survey by AERC in 1980. The historic site has been extensively disturbed by heavy equipment. The foundation has been destroyed and the coal loadout has been collapsed and pushed into the bed of Pace Creek. The original Snow Mine rock-covered adit and stonewall are still on the other side of Pace Creek. There are also two 6' x 10' dugouts used as coal loadouts on the west side of the road. The integrity of the site has been basically destroyed. The site is not recommended for the NRHP (Senulis: 2001).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Impact Associated with the Alternative A-No Action

Associated impacts identified with the No Action Alternative are derived from the inability to approve the CFC exploration wells. The action as proposed would need to be relocated and/or abandoned. CFC would need to establish some other means to facilitate the associated actions of exploration activities within the Pace Canyon area. There would be no direct impact to resources as a result of selecting this alternative.

4.2 Impacts Associated with Alternative B-Proposed Action

4.2.1 Analysis Assumptions For the purpose of analysis, several assumptions have been adopted. All relating provisions of the Price Field Office stipulations for minor coal exploration would be followed, as well as all agreements in place between CFC and the Price Field Office for field development and resource protection.

4.3 Soils

The total disturbance for all seven-drill holes is projected at .94 acres. Four of the seven drill holes would be located on existing roads that are presently being used or on old roads. Due to small drill pads required for this project, traffic would still remain on the Pace Canyon Road and would not require additional disturbance. This short-term disturbance, along with proposed erosion controls and with reclamation activities being completed this year, should have very little impact on the soils in the project area.

4.3.1 Mitigation Measures outlined in the Proposed Action to protect the soils and prevent erosion would be sufficient and no mitigation would be required

4.4 Vegetation

Impacts directly associated with the Proposed Action is estimated to be .94 acres, thus the impact would be minimal and temporary. Approximately 64 percent (0.60 acres) of the disturbance would be on previously disturbed sites or existing roads. Vegetation removed would consist mainly of sagebrush and grass. Approximately three small diameter, under three inches, Douglas-fir trees would also have to be removed. Revegetation of the site with the suggested seed mixture in Table 4 would result in a more diverse plant community. This seed mixture, as compared to natural revegetation, should generate a better and faster ground cover.

Drilling activities will be short lived and the disturbances reseeded as conditions become favorable.

4.4.1 Mitigation Due to the fact that the area will be reseeded the first available growing season and the site was previously heavily disturbed, no mitigation is warranted.

4.5 Wildlife Resources and Threatened, Endangered, and Sensitive Species

Impacts directly associated with the Proposed Action, due to the limited disturbance, would be minimal and temporary. The major impact associated with this action would be the disturbance of wildlife from the increased vehicle travel in the area. No active raptor nests, including Mexican spotted owls were located near the Proposed Action area and with exploration activities commencing after July 15, drilling activities should not have an impact on raptor nesting or deer and elk fawning and calving.

4.5.1 Mitigation In accordance with the requirements of the State of Utah Coal Mining Regulations (R645-200 through R645-203), UDOGM stipulations for "Minor Exploration", and the BLM, as well as the relatively small resource disturbance (.94 acres) associated with the Proposed Action, no mitigation would be required. These state regulations address environmental requirements associated with coal exploration and stipulates environmental data and reclamation activities necessary to obtain UDOGM approval. BLM guidelines require mitigation for disturbances in excess of 10 acres.

4.6 Hydrology

Potential affects of this action would be 1) increased sediment loading to Pace Canyon Creek by runoff of disturbed soils, 2) introduction of pollutants into alluvial ground water through boreholes, and 3) contamination of ground or surface water from spills. The proponent, in their Coal Exploration Plan submitted to the BLM, would protect surface waters with the Fuel/Oil Spill Plan (Appendix A). This plan address measures to be taken if a spill were to occur. Methods employed to control runoff such as, berms, silt fences, and pond lining would also minimize the potential for surface water contamination. The potential for ground water contamination, due to the shallow depth of the drill holes would be minimized with proper completion and plugging of the drill holes as outlined in the Proposed Action section.

4.6.1 Mitigation The application of BMP's such as, silt fences and berms during construction would help minimize sediment loading to Pace Canyon Creek. Implementation of the Spill Plan and proper cementation of the drill holes would be sufficient to prevent surface and ground water impacts and thereby, making mitigation unnecessary.

4.7 Cultural Concerns

Impacts associated with the Proposed Action would not have an affect on the existing historic site. The loadout remains of the old Snow Mine are basically destroyed according to Senulis: 2001. The remaining two dugouts on the west side of Pace Creek would not be disturbed by drilling activities and the remaining old portal adits are located on the other side of Pace Creek away from all activities.

4.7.1 Mitigation Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the operator, or any person working on his behalf, on public land is to be immediately reported to the Price BLM Office. The operator will suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Price BLM office. An evaluation of the discovery will be made by the BLM to determine appropriate actions to prevent the loss of significant cultural or scientific values. The operator is responsible for the cost of evaluation of any site found during construction. The BLM will determine what mitigation is necessary.

5.0 CUMULATIVE IMPACTS

5.1 Cumulative Impacts Associated with the Proposed Action

Activities proposed in the immediate area above CFC's Dugout Canyon Mine are six methane degasification holes. Total disturbance from these drill holes and associated roads is 3.01 acres. These holes would help to reduce methane concentrations in the mine thereby, making mining operations safer. All holes would be located on private property. Depending upon the results of this Proposed Action, the proponent may develop ventilation facilities in Pace Canyon. The extent of these facilities could vary from new portals to a new ventilation fan. Total disturbance is estimated to be less than .5 acres and most likely would be located on one of the seven proposed drill sites covered by this EA.

Other activities within the area include cattle grazing, logging and operations associated with the running the Dugout Canyon Mine. Logging activities over several decades have disturbed large tracts of lands. No other cumulative or residual impacts would be anticipated. Refer to Appendix D for a list of environmental safeguards associated with this EA.

6.0 CONSULTATION AND COORDINATION

6.1 Interdisciplinary Team (Bureau of Land Management)

• Don Stephens, Geologist	Project Manager
• Kerry Flood, Hydrologist	Hydrology
• Brad Higdon, NEPA Coordinator	NEPA Development
• Mark Mackiewicz, Realty Specialist/Soils	Soils
• Blaine Miller, Archaeologist	Cultural Resources
• David Mills, Wildlife Biologist	Wildlife Resources
• Karl Ivory, Range Management Specialist	Grazing

6.2 List of Preparers

6.2.1 EIS Environmental and Engineering Consulting; Helper, Utah

Tom Paluso — Project Manager and Resource Coordinator
B.S. Engineering
M.S. Civil/Environmental Engineering

Melvin Coonrod — Wildlife
B.S. Ecology
B.S. Chemistry and Invertebrate Zoology
M.S. Silviculture

Dave Basinger — Vegetation and Wildlife
B.S. Botany

Rick Richey — GIS/AutoCad Mapping
A.D. Graphic Design

Dan Larsen — Soils
B.S. Conservation of Natural Resources
M.S. Soil Science

6.2.2 SENCO-PHENIX; Price, Utah - Assessment of Cultural Resources

- John Senulis, Archaeologist

6.2.3 MT. NEBO SCIENTIFIC; Springville, Utah - Assessment of Threatened, Endangered and Sensitive Species

- Patrick Collins, Owner, Ph. D.

6.3 Agencies, Organizations and Individuals Contacted

Contacts with the associated land use agencies, interested parties, and individuals have been made during the course of this EA. The input from meetings, briefings, and conversations has resulted in the completion of this document. A list of specific individuals contacted is listed under references.

6.3.1 Federal Government/Agencies

- U.S. Department of Agriculture
  - Natural Resource Conservation Service - Soil Resources and Prime and Unique Farmlands
- U.S. Department of the Interior
  - U.S. Fish and Wildlife Service - Assessment of Raptor and Threatened and Endangered Species

6.3.2 State of Utah

- Department of Natural Resources
  - Division of Wildlife - Assessment of Wildlife and Habitat Resources

6.3.3 Industry and Business

- Vicky Miller, Environmental Specialist:
  - Canyon Fuel Company
- Mike Stevenson, Senior Geologist:
  - ArkLand Company

6.4 References

Willey, David. 2000. Surveys for Mexican Spotted Owls within Breeding Habitat Predicted by GIS on the Tavaputs Plateau and in Desolation Canyon- Final Report. UDWR. 16 pp.

APPENDIX A FUEL/OIL SPILL PLAN

Fuel/Oil Spill Plan

The following steps will be taken during the project in the event of a fuel, oil, or other spill of hazardous or toxic material.

1. The drill rig will be inspected for oil leaks before being brought into the project area. Any leaks will be repaired and the equipment thoroughly cleaned.

2. An impermeable layer (tarp or other liner) will be placed under the rig and any pooled material will be soaked up with absorbent pads, placed in plastic bags, and removed from the site.

3. Contaminated soil will be isolated and removed from the site.

4. Any contaminated soil will be hauled to a certified waste disposal site.

5. If removal of contaminated soil occurs, the area of removal will be reclaimed and reseeded as per other permitted drill site locations.

APPENDIX B COMMON/SCIENTIFIC NAMES

Common Name	Scientific Name
Big Sage brush	*Artemisia tridentate*
Bigtooth maple	*Acer Grandidentatum*
Bluebunch wheatgrass	*Agropyron spicatum*
Burrowing owl	*Athene cunicularia*
Cheat grass	*Bromus tectorum*
Cliff rose	*Purshia mexicana*
Creutzfeldt cryptantha	*Cryptantha creutzfeldtii*
Despain footcactus	*Pediocactus Despainii*
Douglas fir	*Pseudotsuga menziesii*
Elk	*Cervus canadensis*
Fairway wheatgrass	*Agropyron cristatum*
Fleabane daisy	*Erigeron spp.*
Fourwing saltbrush	*Atriplex canescens*
Golden eagle	*Aquila shrysaetos*
Houndstongue	*Cynoglossum officinale*
Indian ricegrass	*Oryzopsis hymenoides*
Intermediate wheatgrass	*Agropyron intermedium*
Loggerhead shrike	*Lanius ludovicianus*
Mexican spotted owl	*Strix occidentalis lucida*
Mule deer	*Odocoileus hemionus*
Northern goshawk	*Accipiter gentelis*
Northern sweetvetch	*Hedysarum boreal*
Oregon grape	*Mahonia repens*
Pacific aster	*Aster chilensis-adscendens*
Penstemons	*Penstemon Species*
Pinyon pine	*Pinus edulis*
Prairie falcon	*Falco mexicanus*
Red elderberry	*Sambucus racemosa*
Red-tailed hawk	*Buteo jamaicensis*
Rocky Mountain juniper	*Juniperous Scopulorum*
Sandberg bluegrass	*Poa secunda*
Serviceberry	*Amelanchier alnifolia*
Small barnet	*Sanguisorba minor*
Snowberry	*Symphoricarpus oreophilus*
Utah juniper	*Juniperous osteosperma*
Western wheatgrass	*Agropyron smithii*
Wright fishhook cactus	*Sclerocactus wrightiae*

APPENDIX C

CANYON FUEL COMPANY 2003 THREATENED, ENDANGERED & SENSITIVE SPECIES INVENTORY

CANYON FUEL
PACE CANYON COAL EXPLORATION
CARBON COUNTY, UTAH

THREATENED, ENDANGERED, AND SENSITIVE FONA SPECIES INVENTORY REPORT

CONDUCTED
SEPTEMBER 2003

BY

EIS ENVIRONMENTAL
AND ENGINEERING
CONSULTING

31 NORTH MAIN STREET
HELPER, UTAH 84526
(435) 472-3814
FAX - (435) 472-8780

Introduction

Canyon Fuel Company has contracted EIS Environmental & Engineering Consulting to conduct inventories for their 2003 Pace Canyon coal exploration program. The exploration area is located in Eastern Utah approximately 15 miles northeast of Wellington in Pace Canyon. The proposed action lies within a previously disturbed section of Pace Canyon.

The proposed drill site and associated activities are required to be surveyed for a variety of threatened, endangered, and sensitive (TES) animal species. Several TES species have been identified by the BLM through past studies as occurring, or potentially occurring within the Pace Canyon area. Using established protocols, qualified Field Biologists of EIS conducted inventories for the following proposed Threatened and Endangered Species, loggerhead shrike (*Lanius ludovicianus*), Bald Eagle (*Haliaeetus leucocephalus*), and neo tropical birds at all areas of concern within the project area. The inventory for this exploration program was conducted September 29th 2003.

Methodology

Loggerhead shrike (*Lanius ludovicianus*)

Loggerhead shrike are generally found in areas which consist of a semi-open area of scattered, mature pinyon-juniper where they could nest in close proximity to sparsely vegetated areas in which they could hunt. Because of the close proximity of the drill sites the are was surveyed as one large site. A total time of 60-90 minutes were spent walking over of the site, using binoculars to note Shrike activity, as well as any other species activity. For inventory purposes, a buffer area (approximately 100 yards) around the site was surveyed

Bald Eagle (*Haliaeetus leucocephalus*)

During the breeding season bald eagles are closely associated with water, along coasts, lakeshores, and/or riverbanks. During the winter bald eagles tend to concentrate wherever food is available. This usually means open water where fish and waterfowl can be caught. They also winter on more upland areas feeding on small mammals and deer carrion. At winter areas, bald eagles commonly roost in large groups in protected areas.

Neo Tropical Birds

More than 300 different species of birds migrated from central and south America every year to mate and raise their young in Canada or the United States. With that many species of birds migrating, nesting sites could be found in many different locations from cities and farms to mountains and deserts. In July of 2000 the Neotropical Migratory Bird Conservation Act was passed by congress protecting habitat for migratory birds in the US, Canada, Mexico, Central America, and South America.

Results

Loggerhead shrike (*Lanius ludovicianus*)

A thorough search of all the drill site and associated areas did not reveal the presence of loggerhead shrike

Bald eagle (*Haliaeetus leucocephalus*)
A thorough search of the drill site and associated areas did not reveal the presence of Bald Eagles. Though this species does occur as an infrequent winter visitor in the area. The affected area does not contain preferred nesting sites for the bald eagle.

Neo-Tropical Birds
Neo Tropical Birds and their habitat are located within the project boundaries. A thorough search of the drill site and associated areas did not reveal the presence of nests.

Individuals who participated in this survey include;

David Basinger, EIS: Environmental & Engineering Consulting
Tom Paluso, EIS: Environmental & Engineering Consulting

I believe the information included in this document to be true and accurate.

David Basinger
Botanist/TES Specialist
EIS: Environmental & Engineering Consulting

MT NEBO SCIENTIFIC, INC.
research & consulting

October 2, 2003

Vicky Miller
CANYON FUEL COMPANY
Dugout Mine
P.O. Box 1029
Wellington, Utah 8454

Vegetation Studies - Pace Canyon Update

Dear Ms. Miller

This letter is intended to provide you with an update on the vegetation sampling in Pace Canyon. Quantitative and qualitative sampling was conducted in the area August 13-14, 2003. The sampling was performed in an area that you outlined on a map and has been proposed for future drilling activities. This area has been previously disturbed by historical mining activities, therefore, I called the plant community "Previously Disturbed Pinyon-Juniper". Additionally, another undisturbed native plant community adjacent to the previously disturbed area was also sampled to serve as a *"Reference Area"* or an area chosen for comparison (or to represent) future standards of revegetation success following final reclamation.

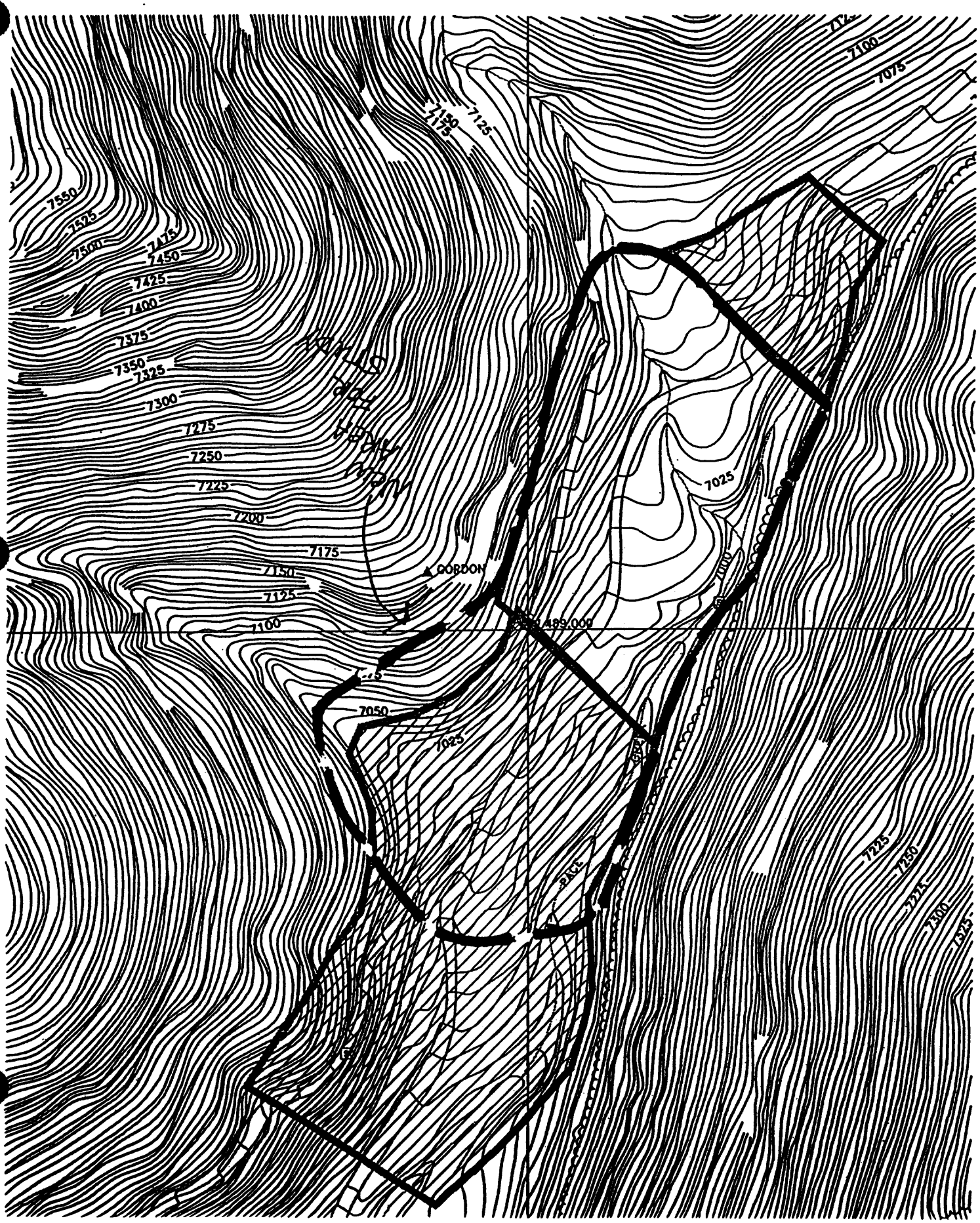
No threatened, endangered or otherwise sensitive plant species were found in the Previously Disturbed Pinyon-Juniper community.

The raw data from the vegetation sampling mentioned above is currently being processed and summarized. A final report will be prepared in the near future.

Please call if you have questions or comments.

Sincerely,

Patrick D. Collins, Ph.D.
Biologist/Environmental Consultant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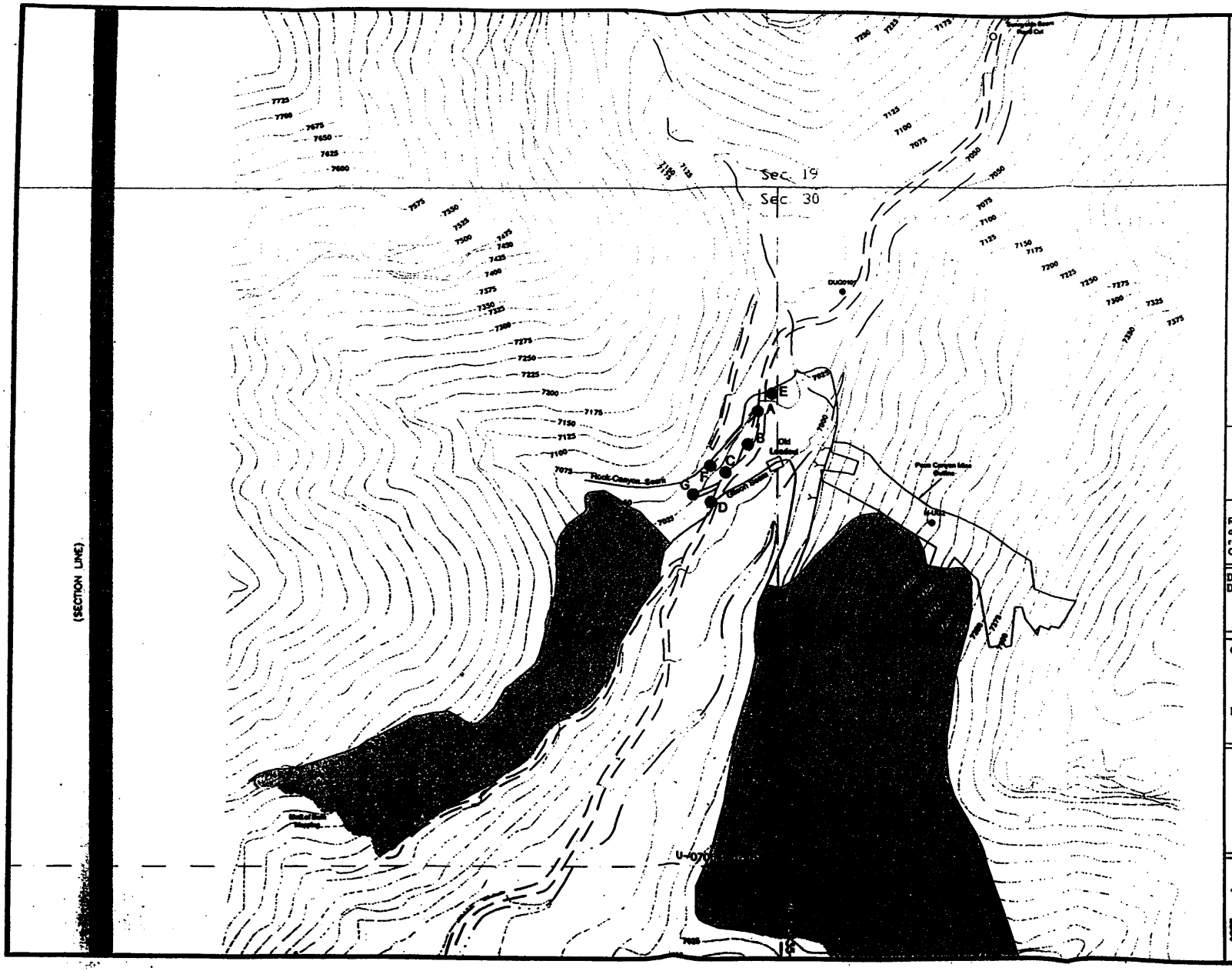
APPENDIX D ENVIRONMENTAL SAFEGUARDS

ENVIRONMENTAL SAFEGUARDS

- State of Utah and Bureau of Land Management's Best Management Practices (BMPs) for erosion control is suggested.
- Fuel/Oil Spill Plan referenced in the Coal Exploration Plan would be followed.
- Drill pits located near streams would be lined or livestock troughs would be used.
- Drill holes would be cemented and flush with surface.
- Mud pits would be backfilled and reclaimed.

PLATE I

PROPOSED ACTION PACE CANYON EXPLORATION PROJECT



EXPLANATION:

- Proposed Exploration Drill Holes
- Lease Boundary
- Existing Roads
- Existing Road--Requires Upgrade
- New Constructed Road
- Burn
- Rock Canyon/Gilson Seam Burn Limit
- Rock Canyon/Gilson Seam Burn Limit (Projected)
- Rock Canyon Seam Outcrop/Subcrop
- Rock Canyon Seam Outcrop/Subcrop (Projected)
- Gilson Seam Outcrop/Subcrop
- Gilson Seam Outcrop/Subcrop (Projected)

N W E S

1000' 0' 2000'

T13S, R12&13E

Reference data provided by Canyon Fuel and Division of Wildlife. E.I.S. is not responsible for errors or omissions. Copyright 2001.

DESIGNED BY: T. Paluso
DRAWN BY: Wild West Drafting & Design Rick Richey
ACAD: DUGOUT/CANYONFUEL/PLATE2

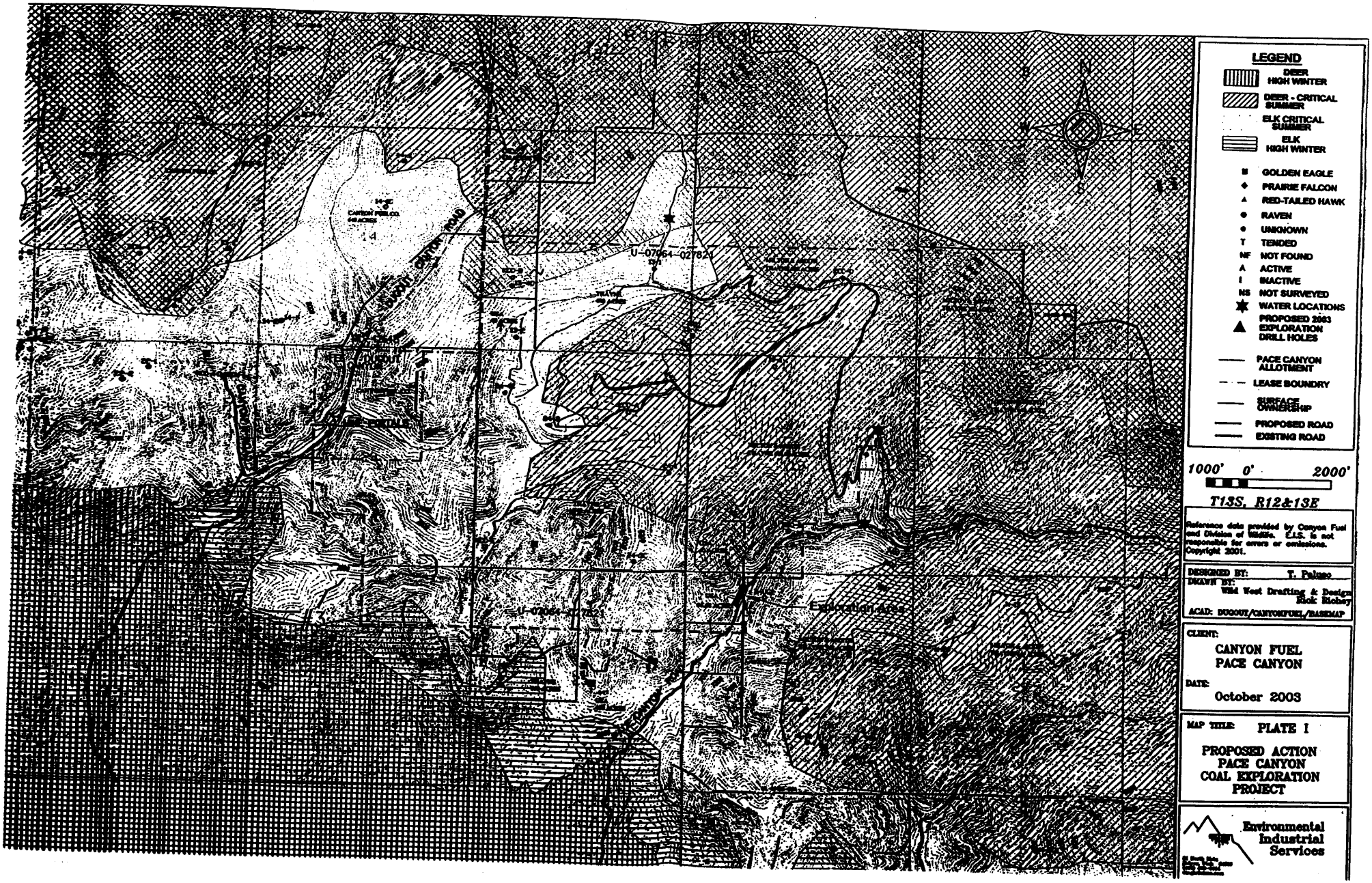
CLIENT:
CANYON FUEL
PACE CANYON

DATE:
October 2003

MAP TITLE: PLATE II
EXPANDED SCALE
PROPOSED ACTION
PACE CANYON
COAL EXPLORATION
PROJECT

Environmental Industrial Services

Environmental & Engineering Consulting


LEGEND
DEER HIGH WINTER
DEER - CRITICAL SUMMER
ELK CRITICAL SUMMER
ELK HIGH WINTER
GOLDEN EAGLE
PRAIRIE FALCON
RED-TAILED HAWK
RAVEN
UNKNOWN
T TENDED
NF NOT FOUND
A ACTIVE
I INACTIVE
NS NOT SURVEYED
WATER LOCATIONS
PROPOSED 2003 EXPLORATION DRILL HOLES
PACE CANYON ALLOTMENT
LEASE BOUNDRY
SURFACE OWNERSHIP
PROPOSED ROAD
EXISTING ROAD
1000' 0' 2000'
T13S, R12&13E
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DESIGNED BY: T. Palmer
DRAWN BY: Wild West Drafting & Design Rick Richey
ACAD: DUGOUT/CANYONFUEL/BASEMAP
CLIENT: CANYON FUEL PACE CANYON
DATE: October 2003
MAP TITLE: PLATE I
PROPOSED ACTION PACE CANYON COAL EXPLORATION PROJECT
Environmental Industrial Services
U-07064-027821
U-07064-027821
Exploration Area
DUGOUT CANYON ROAD
PACE CANYON ROAD
Canyon Fuel Co. 48 Acres
13

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
350 N. 400 E.
Price, UT 84501
(435) 637-0041
FAX (435) 637-3146

NRCS Utah

November 8, 2004

Ms Vicky Miller
Canyon Fuel Company, LLC
Dugout Canyon Mine
P.O. Box 1029
Wellington, UT 84542

DEC 10 2004

Re: Production estimates and soils information for Proposed Degas Well G-7, as well as proposed surface facilities within Pace Canyon (T 13S., R 13E., Sec 30 N1/2 of the NW1/4).

Ms. Miller,

Following our meetings regarding the two above mentioned locations, I have collection Ecological Site Description (ESD) data for the different locations as well as the NRCS Non Technical Soil Descriptions for the areas of concern. As we have discussed, as weather conditions have made the area impassible, onsite visits were not possible this year. However, I vividly recall the areas as I conducted productions estimates for degas wells G-1 – G-6 the previous year. I have included the following information for your review:

- **Proposed Degas well G-7**
  - *ESD*: "Mountain Shallow Loam (Mountain Big Sagebrush)" Based off of field visits throughout the 2004 growing season and precipitation amounts received, I have concluded that the area would have experienced average production. Please review page 4 of the "Mountain Big Sagebrush" ESD for production estimates for the site.
  - Non Technical Soil Descriptions "Beji-Trag Complex"

- **Proposed Surface Facilities in Pace Canyon**
  - *Western facing slopes ESD*: "High Mountain Loam (Aspen)" Based off normal year with a "medium canopy cover class", refer to page 3 of the "Aspen" ESD for production estimates for the site.
  - *Eastern facing slopes ESD*: "Upland Very Steep Stony Loam (Pinyon/Utah Juniper)" Based off an average year for production, refer to page 4 of "Pinyon/Utah Juniper" ESD for production estimates.

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

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- Although much of the area has been previously disturbed I have also included the Non Technical Soil Descriptions for "Croydon Loam, 8-30 Percent Slopes", "Podo-Rock Outcrop Complex", "Rock Outcrop-Rubbleland-Travessilla Complex".

If you have any questions or comments please feel free to contact me at any time.

Sincerely,

M. Dean Stacy
Range Management Specialist

CC: Tim Julander, Acting District Conservationist
Gary Roeder, Area Resource Conservationist
file

FIELD OFFICE TECHNICAL GUIDE: SECTION IIE
LOCATION: MLRA 047A
AREA:
STATE: UTAH

Pace Canyon
Surface Facilities

FORESTLAND SITE DESCRIPTION

FOREST SITE NAME: HIGH MOUNTAIN LOAM (ASPEN)

FOREST SITE NUMBER: 047AY508UT

ORIGINAL DATE: 08/23/1993

AUTHOR'S INITIALS: DLT TW

A. FOREST CHARACTERISTICS

1. FOREST COMMUNITY TYPE

Overstory: QUAKING ASPEN (POPULUS TREMULOIDES)

Understory: MOUNTAIN BROME, SLENDER WHEATGRASS

Site Index: 40 to 50

2. ENVIRONMENT

THIS SITE OCCURS ON GENTLY SLOPING TO STEEP MOUNTAIN SLOPES OF 5 TO 10 PERCENT, BUT MOSTLY 5 TO 40 PERCENT. ELEVATION RANGES FROM 6200 TO 9500 FEET. IT IS FOUND ON ALL EXPOSURES BUT IS PRIMARILY ON THE NORTH AND EAST AT 6200 TO 7500 FEET. THE AVERAGE ANNUAL PRECIPITATION IS 25 TO 35 INCHES, THE MEAN ANNUAL AIR TEMPERATURE IS 36 TO 46 DEGREES F, AND THE MEAN SOIL TEMPERATURE IS 38 to 48 DEGREES F. THE FROST-FREE PERIOD IS 30 TO 80 DAYS. SITE INDEX OF ASPEN IS BASED ON AN 80-YEAR GROWTH CYCLE.

REFERENCES:
MUEGGLER, WATLER F., 1988 ASPEN COMMUNITY TYPES OF THE INTER-MOUNTAIN REGION, GENERAL TECHNICAL REPORT, INT-250, PAGE 20, POTR/TALL/FORB
NEVADA SOIL CONSERVATION SERVICE FOREST SUITABILITY GROUP DESCRIPTION 028BY067NV

3. SOILS

SOILS ARE DEEP AND WELL DRAINED. SURFACE LAYERS ARE DARK 14 TO 26 INCHES THICK. THE SURFACE LAYERS ARE MAINLY LOAM, SILT LOAM, OR CLAY LOAMS AND IN PLACES ARE STONY, GRAVELLY, COBBLY, OR VERY COBBLY. THE SUBSOIL AND SUBSTRATUM ARE MAINLY LOAM, CLAY LOAM, SILTY CLAY LOAM, OR CLAY, AND ARE STONY, COBBLY, OR GRAVELLY. THEY ARE GENERALLY SLIGHTLY ACID TO VERY STRONGLY ACID. THEY FORMED ON GENTLY SLOPING TO VERY STEEP MOUNTAIN SLOPES IN MATERIAL WEATHERED FROM SANDSTONE, SHALE, LIMESTONE, QUARTZITE, AND IGNEOUS ROCKS. THE SURFACE HAS A THIN 1 TO 3

INCH LAYER OF LEAVES, TWIGS, AND DUFF. THE AMOUNT OF ROCK IS VARIABLE IN THE PROFILE. INTAKE RATE IS MODERATE TO RAPID AND WATER MOVEMENT THROUGH THE SOIL IS MODERATE TO SLOW. ROOTS PENETRATE THE SOIL READILY. WATER HOLDING CAPACITY IS HIGH AT 10 TO 14 INCHES FOR A 6-FOOT PROFILE. WATER SUPPLYING CAPACITY IS 16 TO 30 INCHES.

LIST OF SOIL TAXONOMIC UNITS OR SOILS MAPPING UNITS FOR ALL SOILS INCLUDED IN THIS SITE:

ERCAN FAMILY GR-L 25-60% SKUTUM L 8-50%
BAIRD HOLLOW L 6-60% HAILMAN L, CB-L 6-60%
MULT L CL CB-L 5-40% ROUNDY L, CB-L 5-60%
CROYDON L 30-60% FLYGARE L 30-60%
LUCKY STAR SIL 15-60% RICHENS L 3-15%
SCAVE L 15-60% RED SPUR L 10-30%
YELJACK L, NORTH 10-30%

4. NATURE OF THE FOREST COMMUNITY

a.

QUAKING ASPEN IS THE DOMINANT OVERSTORY PLANT. OVERSTORY TREE CANOPY COVER WILL VARY FROM 25 TO 70 PERCENT, BUT IS MOST COMMON FROM 40 TO 55 PERCENT. SHADE TOLERANT PLANTS SUCH AS BLUE WILDRYE, BEARDED WHEATGRASS, MOUNTAIN BROME, NODDING BLUEGRASS, SWEETANICE, MEADOWRUE, AND EDIBLE VALERIAN ARE THE DOMINANT UNDERSTORY SPECIES.

b. Productivity Rating of Major Understory Species:

Productivity Rating Index: This rating provides an index to the relative importance of species in the understory community as affected by overstory canopy cover.

PRODUCTIVITY INDEX

1	Always present:	MORE THAN 50% OF TOTAL UNDERSTORY PRODUCTION
2	Always present:	25 TO 50% OF TOTAL UNDERSTORY PRODUCTION
3	Generally present:	10 TO 24% OF TOTAL UNDERSTORY PRODUCTION
4	Frequently present:	5 TO 9 % OF TOTAL UNDERSTORY PRODUCTION
5	Occasionally present:	1 TO 5% OF TOTAL UNDERSTORY PRODUCTION
6	Rarely present:	LESS THAN 1% OF TOTAL UNDERSTORY PRODUCTION

FOREST SITE NAME: HIGH MOUNTAIN LOAM (ASPEN)
FOREST SITE NUMBER: 047AY508UT

Plant Symbol	Plant Name	OVERSTORY CANOPY CLASS 0-10%	11-20%	21-35%	36-60%
BRCA5	MOUNTAIN BROME	3	3	2	1
ELGL	BLUE WILDRYE	3	3	2	1
ELTR7	SLENDER WHEATRASS	3	3	3	2
PORE	NODDING BLUEGRASS	3	2	2	2
CAGE2	GEYER SEDGE	3	3	2	2
STNE3	COLUMBIA NEEDLEGRASS	4	3	3	3
POPR	KENTUCKY BLUEGRASS	3	3	3	3
LALA3	THICKLEAF PEAVINE	3	3	2	2
VAED	TOBACCO ROOT	4	3	2	1
OSOC	SWEETANICE	4	3	2	1
AGUR	NETTLELEAF GIANT HYSSOP	4	4	3	2
THFE	FENDLER MEADOWRUE	4	3	2	1
SYOR2	MOUNTAIN SNOWBERRY	4	3	2	2
MARE11	CREEPING OREGON GRAPE	4	4	3	2
PRVI	CHOKECHERRY	6	5	5	4

c. Total Average Understory Production by Overstory Canopy Class:

	CANOPY COVER CLASS Open 0-10%	Sparse 11-20%	Medium 21-35%	Dense 36-60%
	lbs/acre (air - dry weight			
Favorable Years	1700	1300	800	600
Normal Years	1200	900	600	400
Unfavorable Years	900	600	400	200

d. Major Sucessional Stages of Forest Development:

HERBACEOUS:

VEGETATION IS DOMINATED BY GRASSES AND FORBS UNDER FULL SUNLIGHT. THIS STAGE IS EXPERIENCED AFTER A MAJOR DISTURBANCE SUCH AS CROWN FIRE OR TREE HARVEST. SKELETON FOREST (DEAD TREES) REMAINING AFTER FIRE OR RESIDUAL TREES LEFT FOLLOWING HARVEST HAVE LITTLE OR NO AFFECT ON THE COMPOSITION AND PRODUCTION OF THE HERBACEOUS VEGETATION.

SHRUB-HERBACEOUS:

HERBACEOUS VEGETATION AND WOOD SHRUBS DOMINATE THE SITE. VARIOUS AMOUNTS OF TREE SEEDLINGS (LESS THAN 20 INCHES IN HEIGHT) MAY BE PRESENT UP TO THE POINT WHERE THEY ARE OBVIOUSLY A MAJOR COMPONENT OF THE VEGETAL STRUCTURE. QUAKING ASPEN IS VERY INTOLERANT OF SHADE. NATURAL PRUNING IS EXCELENT AND LONG, CLEAN STEMS ARE USUALLY PRODUCED WHEN SIDE SHADE IS PRESENT.

SAPLING:

IN THE ABSENCE OF DISTURBANCE, THE TREE SEEDLINGS DEVELOP INTO SAPLINGS (20 INCHES TO 4.5 FEET IN HEIGHT) WITH A RANGE IN CANOPY COVER OF ABOUT 5 TO 10 PERCENT. VEGETATION CONSISTS OF GRASSES, FORBS, AND SHRUBS IN ASSOCIATION WITH TREE SAPLINGS.

IMMATURE FOREST:

THE VISUAL ASPECT AND VEGETAL STRUCTURE ARE DOMINATED BY QUAKING ASPEN GREATER THAN 4.5 FEET IN HEIGHT. SEEDLINGS AND SAPLINGS ARE PRESENT IN THE UNDERSTORY. UNDERSTORY VEGETATION IS MODERATELY INFLUENCED BY A TREE OVERSTORY CANOPY OF ABOUT 10 TO 20 PERCENT.

MATURE FOREST:

THE VISUAL ASPECT AND VEGETAL STRUCTURE ARE DOMINATED BY QUAKING ASPEN THAT HAVE REACHED OR ARE NEAR MAXIMAL HEIGHTS FOR THE SITE. TREES HAVE DEVELOPED TALL, STRAIGHT, CLEAR STEMS WITH SHORT, HIGH ROUNDED CROWNS. TREE CANOPY COVER RANGES FROM 20 TO 40 PERCENT. UNDERSTORY VEGETATION IS STRONGLY INFLUENCED BY TREE COMPETITION, OVERSTORY SHADING, DUFF ACCUMULATION, ETC. FEW SEEDLINGS AND/OR SAPLINGS OF QUAKING ASPEN OCCUR IN THE UNDERSTORY.

Climax Forest:

IN THE ABSENCE OF WILDFIRE OR OTHER NATURALLY OCCURRING DISTURBANCES, THE TREE CANOPY ON THIS SITE CAN BECOME VERY DENSE. THIS STAGE IS DOMINATED BY QUAKING ASPEN THAT HAVE REACHED MAXIMAL HEIGHTS FOR THE SITE. TREES HAVE STRAIGHT, CLEAR STEMS WITH SHORT, HIGH ROUNDED CROWNS. UNDERSTORY VEGETATION IS SPARSE TO ABSENT DUE TO TREE COMPETITION, OVERSTORY SHADING, DUFF ACCUMULATION, ETC. TREE CANOPY COVER IS AT A MAXIMUM FOR THE SITE AND IS COMMONLY GREATER THAN 50 PERCENT.

5. PRODUCTIVE CAPACITY

Productivity Class: 1.0

CMAI: 16 to 21 cu ft/ac./yr

1.1 to 1.5 cu m/ha./yr

Fuelwood Production:

8 TO 10 CORDS PER ACRE PER YEAR. FIREWOOD IS COMMONLY MEASURED BY CORDS OR A STACKED UNIT EQUIVALENT TO 128 CUBIC FEET. ASSUMING AN AVERGE OF 90 CUBIC FEET OF SOLID VOLUME WOOD PER CORD, THERE ARE ABOUT 196,400 BRITISH THERMAL UNITS (BTU'S) PER CUBIC FOOT OR ABOUT 17 MILLION BTU'S OF HEAT VALUE IN A CORD OF QUAKING ASPEN.

SAW TIMBER: 200 TO 300 BOARD-FEET PER ACRE PER YEAR.

6. WATERSHED

THE SOILS ARE IN HYDROLOGIC GROUPS B AND C. THE RUNOFF CURVE NUMBERS ARE 61 TO 86 DEPENDING ON THE OVERALL WATERSHED CONDITION.

7. WILDLIFE

WILDLIFE SPECIES SEEKING FOOD AND COVER IN THIS FOREST SITE INCLUDE MOOSE, ELK, MULE DEER, BEAR, PORCUPINE, SHOWSHOE HARE, OWL, AND WOODPECKER.

8. THREATENED AND ENDANGERED SPECIES

THIS SECTION WILL BE COMPLETED AS INFORMATION IS AVAILABLE.

9. LIMITATIONS AND CONSIDERATIONS

A. POTENTIAL FOR SHEET AND RILL EROSION IS MODERATE TO SEVERE DEPENDING ON SLOPE.

B. MODERATE TO SEVERE EQUIPMENT LIMITATIONS ON WET SOILS DURING CRITICAL TIMES OF THE YEAR.

C. PROPER SPACING IS THE KEY TO A WELL MANAGED, MULTIPLE USE AND MULTI-PRODUCT ASPEN FOREST.

10. ESSENTIAL REQUIREMENTS

A. ADEQUATELY PROTECT FROM HIGH INTENSITY WILDFIRE.

B. PROTECT SOILS FROM ACCELERATED EROSION.

C. APPLY PROPER GRAZING MANAGEMENT PRACTICES (SEE MANAGEMENT GUIDES).

11. SILVICULTURAL PRACTICES

A. HARVEST CUT SELECTIVELY OR IN SMALL PATCHES (SIZE DEPENDENT UPON SITE CONDITIONS) TO ENHANCE FORAGE PRODUCTION.

1. THINNING AND IMPROVMENT CUTTING--REMOVAL OF POORLY FORMED, DISEASED, AND LOW VIGOR TREES FOR FUELWOOD.

2. HARVEST CUTTING--SELECTIVELY HARVEST SURPLUS TREES TO ACHIEVE DESIRED SPACING. HARVEST STANDS IN SMALL BLOCKS OF 1/5 TO 1/2 ACRE WITH SLASH LEFT IN PLACE TO SHELTER EMERGING ASPEN SUCKERS FROM BROWSING.

3. SPACING GUIDE: A SPACING OF ABOUT 15 X 15 FEET IS CONSIDERED DESIRABLE FOR MULTIPLE USE MANAGEMENT DURING PERIOD OF STAND MATURITY.

B. SELECTIVE TREE REMOVAL ON SUITABLE SITES TO ENHANCE FORAGE PRODUCTION AND MANAGE SITE REPRODUCTION.

12. FORAGE PRODUCTS

a. Livestock Grazing

THIS SITE IS SUITED TO CATTLE AND SHEEP GRAZING DURING THE SUMMER AND FALL. LIVESTOCK WILL OFTEN CONCENTRATE ON THIS SITE TAKING ADVANTAGE OF THE SHADE AND SHELTER OFFERED BY THE TREE OVERSTORY. GRAZING MANAGEMENT SHOULD ALLOW ASPEN SAPLINGS TO ATTAIN A MINIMUM HEIGHT OF 55 TO 60 INCHES BEFORE USE TO PREVENT DESTRUCTIVE BROWSING BY LIVESTOCK. HARVESTING TREES UNDER A SOUND MANAGEMENT PROGRAM FOR FUELWOOD OR OTHER PRODUCTS CAN OPEN UP THE TREE CANOPY TO ALLOW INCREASED PRODUCTION OF UNDERSTORY SPECIES DESIRABLE FOR GRAZING WHILE REJUNEVATING THE ASPEN FOREST.

b. Initial Stocking Rates

STOCKING RATES VERY WITH SUCH FACTORS AS KIND AND CLASS OF GRAZING ANIMAL, SEASON OF USE AND FLUCTUATIONS IN CLIMATE. ACTUAL USE RECORDS FOR INDIVIDUAL SITES, TOGETHER WITH A DETERMINATION OF THE DEGREE TO WHICH THE SITES HAVE BEEN GRAZED AND AN EVALUATION OF TREND IN SITE CONDITION, OFFER THE MOST RELIABLE BASIS FOR DEVELOPING INITIAL STOCKING RATES.

SELECTION OF AN INITIAL STOCKING RATES FOR GIVEN GRAZING UNITS IS A PLANNING DECISION. THIS DECISION SHOULD BE MADE ONLY AFTER CAREFUL CONSIDERATION OF THE TOTAL RESOURCES AVAILABLE, EVALUATION OF ALTERNATIVES FOR USE AND TREATMENT, AND ESTABLISHMENT OF OBJECTIVES BY THE DECISIONMAKER.

c. Forage Value Rating

Plant Symbol	Common Name	Relative Forage Value to: Cattle	Horses	Sheep	Deer
BRCA5	MOUNTAIN BROME	P	P	D	D
ELGL	BLUE WILDRYE	P	P	D	D
ELTR7	SLENDER WHEATGRASS	P	P	D	D
PORE	NODDING BLUEGRASS	P	P	P	D
CAGE2	GEYER SEDGE	P	P	U	D
STNE3	COLUMBIA NEEDLEGRASS	P	P	D	D
POPR	KENTUCKY BLUEGRASS	P	P	P	P
LALA3	THICKLEAF PEAVINE	P	D	P	P
VAED	TOBACCO ROOT	D	U	P	P
OSOC	SWEETANICE	D	D	P	P
GABO2	NORTHERN BEDSTRAW	U	U	D	D
RUOC2	WESTERN CONEFLOWER	U	U	P	D
SESE2	BUTTERWEED	U	U	P	D
AGUR	NETTLELEAF GIANT HYSSOP	D	D	P	U
THFE	FENDLER MEADOWRUE	U	U	D	D

FIELD OFFICE TECHNICAL GUIDE: SECTION II E
LOCATION: MLRA 034
AREA:
STATE: UTAH

RANGE SITE DESCRIPTION

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON UTAH JUNIPER)

RANGE SITE NUMBER: 034XY344UT

ORIGINAL DATE: 05/15/1981

REVISION DATE: 01/13/1994

AUTHOR'S INITIALS: JLB GWL

I. SOIL NARRATIVE:

THIS SITE OCCURS ON BACKSLOPES IN MOUNTAIN CANYONS. THE SOIL IS 20 TO 40 INCHES DEEP AND WELL DRAINED. IT FORMED IN COLLUVIUM AND RESIDUUM DERIVED MAINLY FROM SANDSTONE AND SHALE. THE SURFACE HORIZON IS A MOLLIC EPIPEDON 7 TO 8 INCHES THICK. THE ROOT ZONE IS 15 TO 18 INCHES THICK. THE AVAILABLE WATER CAPACITY IS 0.06 TO 0.12 INCHES PER INCH. FIFTY TO 70 PERCENT OF THE SOIL SURFACE IS COVERED BY ROCK FRAGMENTS. AVERAGE ANNUAL SOIL LOSS IN POTENTIAL IS APPROXIMATELY 3 TONS PER ACRE. AVERAGE ANNUAL PRECIPITATION IS 14 TO 16 INCHES. APPROXIMATELY 60 PERCENT OCCURS AS RAIN FROM MARCH THROUGH OCTOBER. MUCH OF THIS SUMMER PRECIPITATION OCCURS AS CONVECTION THUNDERSTORMS. ON THE AVERAGE, NOVEMBER THROUGH FEBRUARY ARE THE DRIEST MONTHS AND JULY THROUGH OCTOBER ARE THE WETTEST MONTHS. THE SOIL TEMPERATURES ARE IN THE MESIC AND FRIGID REGIMES. THE AVERAGE FREEZE-FREE PERIOD IS 90 TO 110 DAYS. IN AVERAGE YEARS, PLANTS BEGIN GROWTH AROUND MARCH AND APRIL AND END GROWTH IN OCTOBER. PLANTS USUALLY REMAIN GREEN UNTIL FROST IN OCTOBER EXCEPT IN DRIER THAN AVERAGE YEARS. THERE IS USUALLY AN ACTIVE GREENUP PERIOD IN THE FALL. THE MOST RAPID GROWTH OCCURS DURING APRIL, MAY, AND JUNE.

II. LIST OF SOIL TAXONOMIC UNITS OR SOILS MAPPING UNITS FOR ALL SOILS INCLUDED IN THIS SITE:

WHETROCK STX-L DRY 50-90% ERODED CABBA FAMILY 40-70%
STRYCH STVL-L 50-70%

III. LANDSCAPE FACTORS

A. PHYSIOGRAPHY:

1. ELEVATION/ASPECT:

LOW 4400 ft / ALL HIGH 7600 ft / ALL

2. PERCENT SLOPE:

LOW 50 HIGH 90

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON-UTAH JUNIPER)
RANGE SITE NUMBER: 034XY344UT

IV. CLIMATE FACTORS

A. FREEZE-FREE PERIOD (FFP): 90 TO 110 (DAYS)

B. FROST-FREE PERIOD: 0 TO 0 (DAYS)

C. MEAN ANNUAL PRECIPITATION (MAP): 14 TO 16 (INCHES)

D. MEAN ANNUAL AIR TEMPERATURE (MAAT): 42 TO 44 (F)

E. MEAN ANNUAL SOIL TEMPERATURE (MAST): 45 TO 47 (F)

F. MOISTURE AND TEMPERATURE DISTRIBUTION:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
- PPT -												
HIGH	0.00	0	0	0	0	0	0	0	0	0	0	0
MEAN	0.47	0.89	1.36	1.10	1.29	1.32	1.28	0.93	1.90	1.12	1.16	0.72
LOW	0.00	0	0	0	0	0	0	0	0	0	0	0
- TEMP -												
HIGH	30	36	48	60	67	78	83	83	72	60	44	32
MEAN	17	24	36	46	53	63	69	68	58	48	33	21
LOW	4	12	24	33	39	48	54	53	45	35	22	9

V. VEGETATION FACTORS - CLIMAX PLANT COMMUNITY

A. RANGE SITE DESCRIPTION NARRATIVE:

THE DOMINANT ASPECT OF THIS SITE IS PINYON AND JUNIPER. THE UNDERSTORY COMPOSITION BY AIR-DRY WEIGHT IS 40 PERCENT PERENNIAL GRASSES, 10 PERCENT FORBS, AND 50 PERCENT SHRUBS.

B. PERCENT COVER:

1. GROUND COVER AND STRUCTURE:

	% CANOPY COVER (VERTICAL VIEW)	AVERAGE HEIGHT (FT)	% BASAL AREA COVER
GRASSES AND GRASSLIKES	20	2.00	10
FORBS	5	1.00	2
CRYPTOGAMS	0	0	0
SHRUBS	30	5.00	15
TREES	25	12.00	10

C. Plant community composition and production:

1. Herbaceous

a. Grasses and grasslikes

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
ORHY	INDIAN RICEGRASS	0	10 to 15	0 to 0
STCO4	NEEDLEANDTHREAD	0	5 to 10	0 to 0
PSSP6	BLUEBUNCH WHEATGRASS	0	5 to 10	0 to 0
LESAS	SALINA WILDRYE	0	3 to 5	0 to 0
BOGR2	BLUE GRAMA	1	1 to 3	3 to 5
CAGE2	GEYER SEDGE	1	1 to 3	3 to 5
POFE	MUTTONGRASS	1	1 to 3	3 to 5
PPGG	OTHER PERENNIAL GRASSES	1	3 to 5	3 to 5
AAGG	OTHER ANNUAL GRASSES	1	3 to 5	3 to 5

b. Forbs

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
EROV	CUSHION WILD BUCKWHEAT	2	3 to 5	10 to 15
SIOF	HEDGE MUSTARD	2	3 to 5	10 to 15
MAGR2	GUMWEED TANSYASTER	2	3 to 5	10 to 15
CRFL5	PLATEAU YELLOW CATSEYE	2	3 to 5	10 to 15
PEPA6	THICKLEAF BEARDTONGUE	2	3 to 5	10 to 15
PHHO	CARPET PHLOX	2	3 to 5	10 to 15
PPFF	OTHER PERENNIAL FORBS	2	10 to 15	10 to 15
AAFF	OTHER ANNUAL FORBS	2	10 to 15	10 to 15

2. Shrubs

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
CEMO2	BIRCHLEAF MOUNTAINMAHOGANY	0	15 to 20	0 to 0
AMAL2	SASKATOON SERVICEBERRY	0	5 to 10	0 to 0
EPVI	MORMONTEA	0	3 to 5	0 to 0
ERMI4	SLENDER WILD BUCKWHEAT	0	3 to 5	0 to 0
ARNO4	BLACK SAGEBRUSH	0	3 to 5	0 to 0
OPPO	CENTRAL PRICKLYPEAR	3	1 to 3	3 to 5
ARTRT	BASIN BIG SAGEBRUSH	3	1 to 3	3 to 5
SSSS	OTHER SHRUBS	3	3 to 5	3 to 5

3. Trees

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
PIED	PINYON	0	12 to 15	0 to 0
JUOS	UTAH JUNIPER	0	3 to 5	0 to 0

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON-UTAH JUNIPER)
RANGE SITE NUMBER: 034XY344UT

5. Production

Grasses and grasslikes:	35 to 45 % of total
Forbs:	10 to 15 % of total
Shrubs:	40 to 50 % of total
Trees:	10 to 20 % of total
Lichen community:	0 lbs/acre (NOT ANNUAL PRODUCTION)
Moss community:	0 lbs/acre

6. Cover

Lichen community:	0 % cover
Moss community:	0 % cover

VI. PLANT GROWTH CURVES

ID	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NUMBER: UT3441	0	0	0	10	30	45	5	5	5	0	0	0

NAME: PNC
DESC: EXCELLENT CONDITION

VII. TOTAL ANNUAL PRODUCTION (EXCELLENT CONDITION)

FAVORABLE	700	TO	800
AVERAGE	500	TO	600
UNFAVORABLE	300	TO	400

IX. PLANT COMMUNITY DYNAMICS:

THIS SITE RECEIVES VERY LITTLE OR NO GRAZING BY LIVESTOCK BECAUSE OF STEEP SLOPES. WHEN THE POTENTIAL NATURAL PLANT COMMUNITY IS BURNED, PINYON, JUNIPER, AND BIRCHLEAF MOUNTAINMAHOGANY DECREASE WHILE SERVICEBERRY AND SALINA WILDRYE INCREASE.

X. ASSOCIATED SITES

Sites that occur in association with this site:

SITE NUMBER: 034XY338UT
SITE NAME: UPLAND VERY STEEP LOAM (PINYON UTAH JUNIPER)

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON-UTAH JUNIPER)
RANGE SITE NUMBER: 034XY344UT

XII. LIVESTOCK VALUES

BECAUSE OF STEEP SLOPES THIS SITE IS GRAZED LITTLE OR NONE BY LIVESTOCK.

XIII. WOOD PRODUCT VALUES

THIS SITE PRODUCES FIRE WOOD, POSTS, AND CHRISTMAS TREES. THE SITE INDEX IS 24.

XIV. WILDLIFE SPECIES LIST

a. Site factors influencing wildlife species:

THIS SITE PRODUCES FOOD AND COVER FOR WILDLIFE.

b. Guide to site use by selected wildlife species:

WILDLIFE USING THIS SITE INCLUDE JACKRABBIT, WOODRAT, PINYON JAY, COYOTE, MULE DEER, AND ELK.

XV. WATERSHED VALUES

THE SOIL IS IN HYDROLOGIC GROUP C. THE RUNOFF CURVE NUMBERS ARE 74 THROUGH 86 DEPENDING ON THE CONDITION OF THE WATERSHED.

XVI. RECREATION AND NATURAL BEAUTY VALUES

THIS SITE HAS AESTHETIC APPEAL BUT VERY LITTLE RECREATION POTENTIAL.

XVII. THREATENED AND ENDANGERED PLANTS

THIS SECTION WILL BE ADDED AS INFORMATION IS AVAILABLE.

XVIII. ARCHAEOLOGICAL VALUES

THIS SECTION WILL BE ADDED AS INFORMATION IS AVAILABLE.

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON-UTAH JUNIPER)
RANGE SITE NUMBER: 034XY344UT

APPENDIX I

Reference Data

1. Site Documentation (number and kind of site inventory records)

0	SCS-ECS-5	0	STATE-ECS-FORM
0	SCS-RANGE-417	0	BLM FORM
0	OTHER		

2. Distribution and extent.

County	State
ROOSEVELT FO	UTAH
PRICE FO	UTAH

3. Location of typical example of this site.

7600' N 400'W OF SE CORNER OF T 16 S R 17 E

Approved by: /s/ Pat L. Shaver
STATE RANGE CONSERVATIONIST
SCS UTAH

Date Approved: June 25, 1994

Approved by: /s/ Pat L. Shaver
WNTC RANGE CONSERVATIONIST
SCS WNTC PORTLAND OR

Date Approved: July 25, 1994

RANGE SITE NAME: UPLAND VERY STEEP STONY LOAM (PINYON-UTAH JUNIPER)
RANGE SITE NUMBER: 034XY344UT

APPENDIX II

1. Soil taxonomic unit representative of this site:

   Soil Taxon

   WHETROCK STX-L DRY 50-80% ERODED

   Soil Survey Area Number

   047

   Taxonomic Classification

   LOAMY-SKELETAL, MIXED ARIDIC CALCIBOROLLS

2. Type location for soils taxonomic unit representative of this site:

   MEASURED FROM THE CORNER OF THE TOWNSHIP AND RANGE

Non Technical Soil Description(s) (NASIS derived)

Soil Survey Area **UT616** **Carbon Area, Utah, Parts of Carbon and Emery Counties**

Mapunit 21 **CROYDON LOAM,8 TO 30 PERCENT SLOPES**

Soil Component Name CROYDON 90 % of the mapunit

Slope range (%): 8 to 30 Depth class: Deep Drainage class: Well drained

Permeability: Slow Available water capacity class: Moderate

Average total available water in top five feet (in.): 8.1

Land capability subclass, non-irrigated: 6c Land capability subclass, irrigated: Not rated

Ecological Site: High Mountain Loam (Aspen)

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (paralithic) 40 - 60

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
A11, A12	0 - 16	L	loam	5.6 - 6.5	NA -	NA -
A2	16 - 23	L	loam	5.6 - 7.3	NA -	NA -
B21t, B22	23 - 48	CL	clay loam	6.1 - 6.5	NA -	NA -
R	48 - 52	WB	weathered bedrock	NA -	NA -	NA -

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Non Technical Soil Description(s) (NASIS derived)

Soil Survey Area **UT616** **Carbon Area, Utah, Parts of Carbon and Emery Counties**

Mapunit 84 **PODO-ROCK OUTCROP COMPLEX**

Soil Component Name PODO 50 % of the mapunit

Slope range (%): 50 to 70 Depth class: Shallow Drainage class: Well drained

Permeability: Slow Available water capacity class: Very low

Average total available water in top five feet (in.): 0.9

Land capability subclass, non-irrigated: 8e Land capability subclass, irrigated: Not rated

Ecological Site: Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) 8 - 20

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
A1	0 - 5			7.9 - 8.4	NA -	NA -
		BYV-SL	very bouldery sandy loam			
C1, C2	5 - 12			7.9 - 8.4	NA -	NA -
		GR-L	gravelly loam			
		GR-SL	gravelly sandy loam			
R	12 - 16			NA -	NA -	NA -
		UWB	unweathered bedrock			

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Soil Component Name ROCK OUTCROP 30 % of the mapunit

Slope range (%): 50 to 70 Depth class: Shallow Drainage class: not rated

Permeability: Very slow Available water capacity class: Very low

Average total available water in top five feet (in.): 0.0

Land capability subclass, non-irrigated: 8s Land capability subclass, irrigated: Not rated

Ecological Site: None

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) -

Horizon Information

	Depth (in)	Textures	pH range	Sodium	Salinity (mmhos/cm)
H1	0 - 60	UWB unweathered bedrock	NA -	NA -	NA -

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Non Technical Soil Description(s) (NASIS derived)

Soil Survey Area **UT616** **Carbon Area, Utah, Parts of Carbon and Emery Counties**

Mapunit 96 **ROCK OUTCROP-RUBBLELAND-TRAVESSILLA COMPLEX**

Soil Component Name ROCK OUTCROP 35 % of the mapunit

Slope range (%): 30 to 70 Depth class: Shallow Drainage class: not rated

Permeability: Very slow Available water capacity class: Very low

Average total available water in top five feet (in.): 0.0

Land capability subclass, non-irrigated: 8s Land capability subclass, irrigated: Not rated

Ecological Site: None

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) -

Horizon Information

	Depth (in)	Textures	pH range	Sodium	Salinity (mmhos/cm)
H1	0 - 60	UWB unweathered bedrock	NA -	NA -	NA -

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Soil Component Name RUBBLELAND 30 % of the mapunit

Slope range (%): 30 to 70 Depth class: Shallow Drainage class: Excessively drained

Permeability: Rapid Available water capacity class: Very low

Average total available water in top five feet (in.): 3.0

Land capability subclass, non-irrigated: 8s Land capability subclass, irrigated: Not rated

Ecological Site: None

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) -

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
H1	0 - 60			NA -	NA -	NA -
		FRAG	fragmental material			

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Soil Component Name TRAVESSILLA 25 % of the mapunit

Slope range (%): 30 to 70 Depth class: Shallow Drainage class: Well drained

Permeability: Slow Available water capacity class: Very low

Average total available water in top five feet (in.): 2.3

Land capability subclass, non-irrigated: 8e Land capability subclass, irrigated: Not rated

Ecological Site: Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) 6 - 20

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
A1	0 - 3			7.4 - 7.8	NA -	NA -
		GRV-FSL	very gravelly fine sandy loam			
C1, C2	3 - 17			7.4 - 8.4	NA -	NA -
		VFSL	very fine sandy loam			
		L	loam			
R	17 - 21			NA -	NA -	NA -
		UWB	unweathered bedrock			

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

G-7

FIELD OFFICE TECHNICAL GUIDE: SECTION II-E
LOCATION: MLRA047A
AREA:
STATE: UTAH

RANGE SITE DESCRIPTION

RANGE SITE NAME: MOUNTAIN SHALLOW LOAM (MOUNTAIN BIG SAGEBRUSH)

RANGE SITE NUMBER: 047AY446UT

ORIGINAL DATE: 12/10/1992

AUTHOR'S INITIALS: DLT DJS

I. SOIL NARRATIVE:

THIS SITE IS FOUND ON ROLLING TO STEEP MOUNTAIN SLOPES AND RIDGES.

SOILS IN THIS SITE ARE STONY OR COBBLY AND SHALLOW OVER BEDROCK (10 TO 20 INCHES). THEY ARE WELL DRAINED. THEY HAVE DARK BROWN SURFACE LAYERS. THE UNDERLYING LAYERS ARE STONY OR COBBLY AND RANGE FROM MODERATELY COARSE TO FINE TEXTURED. THEY FORMED ON STRONGLY SLOPING TO VERY STEEP MOUNTAIN SLOPES IN MATERIAL WEATHERED FROM SANDSTONE, SHALE, LIMESTONE, QUARTZITE AND IGNEOUS ROCKS. INTAKE RATE IS MODERATE AND WATER MOVEMENT THROUGH THE SOIL IS MODERATE TO SLOW ABOVE THE BEDROCK. ROOTS PENETRATE THE SOIL MATERIAL READILY ABOVE THE BEDROCK AND INTO ROCK FRACTURES. WATERHOLDING CAPACITY IS LOW DUE TO THE SHALLOW DEPTH AND ROCK FRAGMENT CONTENT OF THE PROFILE. IT RANGES FROM 1.5 TO 3.0 INCHES WITH A WATER SUPPLYING CAPACITY OF 5 TO 8 INCHES. RUNOFF WILL OCCUR ON THESE SOILS BECAUSE SOIL DEPTH LIMITS WATER STORAGE CAPACITY.

THE CLIMATE OF THIS SITE IS COOL AND QUITE HUMID WITH COLD SNOWY WINTERS AND COOL DRY SUMMERS. THE AVERAGE ANNUAL PRECIPITATION VARIES FROM 16 TO 22 INCHES WITH AN AVERAGE OF AROUND 19. DISTRIBUTION IS 55 TO 60% DURING THE PLANT DORMANT PERIOD (OCTOBER TO MARCH). THIS IS THE MOST DEPENDABLE SUPPLY FOR PLANT GROWTH. LOWER PRECIPITATION AND HIGH EVAPO-TRANSPIRATION RATES DURING JULY, AUGUST, AND SEPTEMBER CAUSES SLOWING DOWN IN GROWTH OF ALL PLANT SPECIES AND DORMANCY IN MOST OF THE GRASSES AND FORBS.

II. LIST OF SOIL TAXONOMIC UNITS OR SOILS MAPPING UNITS FOR ALL SOILS INCLUDED IN THIS SITE:

AGASSIZ CBV-L, 8 TO 25%
GABICA STE-L, 10 TO 50%
AGASSIZ CBV-L, 25 TO 60%
WALLSBURG CBV-SCL, 20 TO 60%
FOXOL CBV-L, 30 TO 70%
WALLSBURG GR-L, 40 TO 60%
FOXOL STE-SL STV-L, 10 TO 60%
BRAD STV-LS, 15 TO 60%
REDCAN FAMILY LOAM, 4 TO 15%
LITTLE POLE CBV-SCL, 6 TO 60%
AGASSIZ ST-SIL, 40 TO 70%
REDCAN CB-L, 40 TO 60%
CURTIS CREEK LOAM, 30 TO 60%

RANGE SITE NAME: MOUNTAIN SHALLOW LOAM (MOUNTAIN BIG SAGEBRUSH)
RANGE SITE NUMBER: 047AY446UT

III. LANDSCAPE FACTORS

A. PHYSIOGRAPHY:

1. ELEVATION/ASPECT:

LOW 5200 ft / ALL HIGH 8500 ft / ALL

2. PERCENT SLOPE:

LOW 15
HIGH 60

IV. CLIMATE FACTORS

A.	FREEZE-FREE PERIOD (FFP):	0	TO	0	(DAYS)
B.	FROST-FREE PERIOD:	50	TO	100	(DAYS)
C.	MEAN ANNUAL PRECIPITATION (MAP):	16	TO	22	(INCHES)
D.	MEAN ANNUAL AIR TEMPERATURE (MAAT):	36	TO	45	(F)
E.	MEAN ANNUAL SOIL TEMPERATURE (MAST):	38	TO	47	(F)

F. MOISTURE AND TEMPERATURE DISTRIBUTION:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
- PPT -												
HIGH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
MEAN	2.71	2.35	2.22	1.80	1.68	1.27	0.79	1.04	1.11	1.69	1.70	1.87
LOW	0.00	0	0.00	0	0	0	0	0.00	0	0.00	0.00	0.00
- TEMP -												
HIGH	34	39	46	56	67	77	86	84	75	63	46	37
MEAN	0	0	0	0	0	0	0	0	0	0	0	0
LOW	10	14	20	28	36	42	49	47	39	30	17	13

V. VEGETATION FACTORS - CLIMAX PLANT COMMUNITY

A. RANGE SITE DESCRIPTION NARRATIVE:

THE DOMINANT ASPECT OF THIS SITE IS THAT OF SHRUBS. THE COMPOSITION BY ANNUAL AIR DRY WEIGHT IS APPROXIMATELY 50% GRASSES, 5% FORBS AND 45% SHRUBS.

B. PERCENT COVER:

1. GROUND COVER AND STRUCTURE:

	% CANOPY COVER (VERTICAL VIEW)	AVERAGE HEIGHT (FT)	% BASAL AREA COVER
GRASSES AND GRASSLIKES	30	2.00	5
FORBS	5	1.00	2
CRYPTOGAMS	0	0.00	0
SHRUBS	20	3.00	8
TREES	0	0.00	0

C. Plant community composition and production:

1. Herbaceous

a. Grasses and grasslikes

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
PSSP6	BLUEBUNCH WHEATGRASS	0	15 to 20	0 to 0
POFE	MUTTONGRASS	0	5 to 10	0 to 0
PASM	WESTERN WHEATGRASS	0	3 to 5	0 to 0
ELEL5	BOTTLEBRUSH SQUIRRELTAIL	0	3 to 5	0 to 0
STCO3	COLUMBIA NEEDLEGRASS	0	3 to 5	0 to 0
LECI4	GREAT BASIN WILDRYE	1	1 to 3	5 to 10
STLE4	LETTERMAN NEEDLEGRASS	1	1 to 3	5 to 10
ORHY	INDIAN RICEGRASS	1	1 to 3	5 to 10
KOMA	PRAIRIE JUNEGRASS	1	1 to 3	5 to 10
PONE3	NEVADA BLUEGRASS	1	1 to 3	5 to 10
FEKI2	KING FESCUE	1	1 to 3	5 to 10
MEBU	BULBOUS ONIONGRASS	1	1 to 3	5 to 10
CAGE2	GEYER SEDGE	1	1 to 3	5 to 10
POSE	SANDBERG BLUEGRASS	1	1 to 3	5 to 10
PPGG	OTHER PERENNIAL GRASSES	1	5 to 10	5 to 10
AAGG	OTHER ANNUAL GRASSES	1	5 to 10	5 to 10

b. Forbs

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
CRAC2	LONGLEAF HAWKSBEARD	2	1 to 1	3 to 5
BASA3	ARROWLEAF BALSAMROOT	2	1 to 1	3 to 5
ERBR5	SHORTSTEM WILD BUCKWHEAT	2	1 to 1	3 to 5
CALI4	WYOMING INDIAN PAINTBRUSH	2	1 to 1	3 to 5
ASOC	WESTERN MOUNTAIN ASTER	2	1 to 1	3 to 5
LIPE2	BLUE FLAX	2	1 to 1	3 to 5
ACMI2	COMMON YARROW	2	1 to 1	3 to 5
PHHO	CARPET PHLOX	2	1 to 1	3 to 5
ASAR4	SILVERLEAF MILKVETCH	2	1 to 1	3 to 5
GEVI2	STICKY PURPLE CRANESBILL	2	1 to 1	3 to 5
LUCAC3	SPURRED LUPINE	2	1 to 1	3 to 5
ORTO	TOLMIE OWLCLOVER	2	1 to 1	3 to 5
CISC2	MEADOW THISTLE	2	1 to 1	3 to 5
HAPA	COMMON STICKSEED	2	1 to 1	3 to 5
PPFF	OTHER PERENNIAL FORBS	2	3 to 5	3 to 5
AAFF	OTHER ANNUAL FORBS	2	3 to 5	3 to 5

2. Shrubs

National Symbol	Common Name	Grp	% Composition by weight	Group % Allowable
ARTRV	MOUNTAIN BIG SAGEBRUSH	0	15 to 20	0 to 0
PUTR2	BITTERBRUSH	0	10 to 15	0 to 0
SYOR2	MOUNTAIN SNOWBERRY	0	3 to 5	0 to 0
CHVIV4	STICKYLEAF LOW RABBITBRUSH	3	1 to 2	3 to 5
AMAL2	SASKATOON SERVICEBERRY	3	1 to 2	3 to 5
ERMI4	SLENDER WILD BUCKWHEAT	3	1 to 2	3 to 5
TECA2	SPINELESS HORSEBRUSH	3	1 to 2	3 to 5
GUSA2	BROOM SNAKEWEED	3	1 to 2	3 to 5
SSSS	OTHER SHRUBS	3	3 to 5	3 to 5

5. Production

Grasses and grasslikes: 45 to 55 % of total

Forbs: 3 to 5 % of total

Shrubs: 35 to 45 % of total

Trees: 0 to 0 % of total

Lichen community: 0.00 lbs/acre (NOT ANNUAL PRODUCTION)

Moss community: 0.00 lbs/acre

6. Cover

Lichen community: 0 % cover

Moss community: 0 % cover

VI. PLANT GROWTH CURVES

ID	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NUMBER: UT4461	0	0	0	5	20	50	5	10	5	5	0	0
NAME: PNC												
DESC: EXCELLENT CONDITION												
NUMBER: UT4462	0	0	0	0	30	50	0	10	10	0	0	0
NAME: GOOD CONDITION NO. 1												
DESC: NEEDLEGRASSES, BLUEGRASSES AND SAGEBRUSH												

VII. TOTAL ANNUAL PRODUCTION (EXCELLENT CONDITION)

FAVORABLE 1600 TO 1700

AVERAGE 1000 TO 1100

UNFAVORABLE 500 TO 600

RANGE SITE NAME: MOUNTAIN SHALLOW LOAM (MOUNTAIN BIG SAGEBRUSH)
RANGE SITE NUMBER: 047AY446UT

IX. PLANT COMMUNITY DYNAMICS:

AS THIS SITE DETERIORATES DUE TO OVERGRAZING PERENNIAL GRASSES DECREASE AND BIG SAGEBRUSH AND LOW RABBITBRUSH INCREASE. FIRE WILL REDUCE BIG SAGEBRUSH DENSITY BUT LOW RABBITBRUSH WILL INCREASE.

X. ASSOCIATED SITES

Sites that occur in association with this site:

SITE NUMBER: 047AY430UT
SITE NAME: MOUNTAIN LOAM (MOUNTAIN BIG SAGEBRUSH)

SITE NUMBER: 047AY476UT
SITE NAME: MOUNTAIN WINDSWEPT RIDGE (LOW SAGEBRUSH)

XI. COMPETING SITES

Similar sites with their differentiae:

SITE NUMBER: 047AY476UT
SITE NAME: MOUNTAIN WINDSWEPT RIDGE (LOW SAGEBRUSH)
DIFFERENTIAE: LANDSCAPE POSITION

XII. LIVESTOCK VALUES

THIS SITE HAS A LARGE AMOUNT OF GRASSES AND SHRUBS (ABOUT EQUAL AMOUNTS BY TOTAL AIR DRY PRODUCTION). THERE IS ONLY A SMALL AMOUNT OF THE TOTAL YIELD THAT IS FORBS BUT A LARGE NUMBER OF SPECIES. WITH THIS COMPOSITION GOOD FORAGE AND BALANCED ANIMAL NUTRITION IS PROVIDED DURING SPRING, SUMMER AND FALL. CATTLE, SHEEP, GOATS AND HORSES GRAZE THIS SITE TO GOOD ADVANTAGE.

XIII. WOOD PRODUCT VALUES

NO VALUES EXIST FOR LUMBER. SOME OF THE SHRUB SPECIES PRODUCE ENOUGH WOOD FOR CAMPFIRES. PRODUCTION OF WOOD PRODUCTS FOR OTHER USES ARE NOT OF A QUANTITY OR QUALITY TO BE OF VALUE.

XIV. WILDLIFE SPECIES LIST

a. Site factors influencing wildlife species:

THIS SITE PRODUCES EXCELLENT FORAGE FOR DEER AND ELK.

b. Guide to site use by selected wildlife species:

THIS SITE IS FAIR HABITAT FOR MANY KINDS OF WILDLIFE.

RANGE SITE NAME: MOUNTAIN SHALLOW LOAM (MOUNTAIN BIG SAGEBRUSH)
RANGE SITE NUMBER: 047AY446UT

XV. WATERSHED VALUES

SOIL SERIES IN THIS SITE ARE GROUPED MAINLY INTO D HYDROLOGIC GROUP. THEY HAVE HIGH RUNOFF POTENTIAL. WHEN THE VEGETATION IS IN CLIMAX (POTENTIAL), THE HYDROLOGIC CURVES ARE 76 TO 73. WHERE RANGE CONDITION HAS DECLINED FROM CLIMAX, FIELD INVESTIGATION IS NEEDED TO DETERMINE HYDROLOGIC CURVE NUMBERS.

XVI. RECREATION AND NATURAL BEAUTY VALUES

THIS SITE HAS GOOD VALUES FOR ESTHETICS AND NATURAL BEAUTY. IT HAS A LARGE NUMBER OF FORBS AND SHRUBS WHICH HAVE FLOWERS IN BLOOM FROM EARLY SPRING THROUGHOUT THE SUMMER AND INTO THE FALL. IT HAS A COMBINATION OF GRASSES, FORBS, SMALL SHRUBS, AND LARGE SHRUBS WHICH OFFER SOME POSSIBILITIES FOR SCREENING AND VALUE AS CAMPING AND PICNICKING AREAS. HUNTING FOR UPLAND GAME, ELK AND MULE DEER IS GOOD TO EXCELLENT ON THIS SITE. FISHING IS OPPORTUNE ON STREAMS THROUGH AND ADJACENT TO THIS SITE.

XVII. THREATENED AND ENDANGERED PLANTS

BOTH THE AMERICAN PEREGINE FALCON AND PRAIRIE FALCON MAY OCCASIONALLY SEEK THEIR PREY ON THIS SITE.

XVIII. ARCHAEOLOGICAL VALUES

TO BE ADDED AS INFORMATION IS PROVIDED.

RANGE SITE NAME: MOUNTAIN SHALLOW LOAM (MOUNTAIN BIG SAGEBRUSH)
RANGE SITE NUMBER: 047AY446UT

APPENDIX I

Reference Data

1. Site Documentation (number and kind of site inventory records)

0	SCS-ECS-5	0	STATE-ECS-FORM
21	SCS-RANGE-417	0	BLM FORM
0	OTHER		

2. Distribution and extent.

County	State
LOGAN F.O.	UTAH
MIDVALE F.O.	UTAH
PROVO F.O.	UTAH
PRICE F.O.	UTAH
RICHFIELD F.O.	UTAH
CEDAR CITY F.O.	UTAH

3. Location of typical example of this site.

SW 1/4; SE 1/4; SE 1/4; SEC. 9 T. 2 S. R. 4 E.

Approved by: /s/ Pat L. Shaver
STATE RANGE CONSERVATIONIST
SCS UTAH

Date Approved: _____

Approved by: /s/ Larry D. Butler
WNTC RANGE CONSERVATIONIST
SCS WNTC PORTLAND OR

Date Approved: _____

APPENDIX II

1. Soil taxonomic unit representative of this site:

   Soil Taxon

   AGASSIZ VCB-L, 8 TO 25 %

   Soil Survey Area Number

   613

   Taxonomic Classification

   LOAMY-SKELETAL, MIXED, FRIGID, LITHIC HAPLOXEROLLS.

2. Type location for soils taxonomic unit representative of this site:

   SW 1/4; SE 1/4; SE 1/4; SEC. 9 T. 2 S. R. 4 E.

3. Listing of soils correlated to this site:

Soil Taxon....: WALLSBURG CBV-SCL, 20 TO 60%
SSA.....: 622
Classification: CLAYEY-SKELETAL, MONTMORILLONITIC, FRIGID LITHIC ARGIXEROLLS

Soil Taxon....: BRAD STV-LS, 15 TO 60%
SSA.....: 613
Classification: SANDY-SKELETAL, MIXED, FRIGID LITHIC HAPLOXEROLLS.

Soil Taxon....: GABICA STE-L, 10 TO 50%
SSA.....: 613
Classification: LOAMY-SKELETAL, MIXED, FRIGID LITHIC ARGIXEROLLS.

Soil Taxon....: REDCAN FAMILY LOAM, 4 TO 15%
SSA.....: 613
Classification: L-SKEL, MIXED (CALCAREOUS), FRIGID, SHALLOW TYPIC XERORTHENT

Non Technical Soil Description(s) (NASIS derived)

Soil Survey Area **UT616** **Carbon Area, Utah, Parts of Carbon and Emery Counties**

Mapunit 7 **BEJE-TRAG COMPLEX**

Soil Component Name BEJE 55 % of the mapunit

Slope range (%): 3 to 15 Depth class: Shallow Drainage class: Well drained

Permeability: Slow Available water capacity class: Very low

Average total available water in top five feet (in.): 2.4

Land capability subclass, non-irrigated: 6s Land capability subclass, irrigated: Not rated

Ecological Site: Mountain Shallow Loam (Mountain Big Sagebrush)

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): Bedrock (lithic) 10 - 20

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
A1	0 - 6			6.6 - 7.8	NA -	NA -
		L	loam			
B2t	6 - 14			7.4 - 8.4	NA -	NA -
		SCL	sandy clay loam			
		L	loam			
		CL	clay loam			
R	14 - 18			NA -	NA -	NA -
		UWB	unweathered bedrock			

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

Soil Component Name TRAG 20 % of the mapunit

Slope range (%): 3 to 30 Depth class: Very deep Drainage class: Well drained

Permeability: Moderately slow Available water capacity class: High

Average total available water in top five feet (in.): 10.8

Land capability subclass, non-irrigated: 6e Land capability subclass, irrigated: Not rated

Ecological Site: MOUNTAIN LOAM (SALINA WILDRYE)

Runoff class: Not Rated Depth to seasonal high water table: NA -

Flooding frequency: None Other restrictions (in): NA -

Horizon Information

	Depth (in)	Textures		pH range	Sodium	Salinity (mmhos/cm)
A1	0 - 5	CL	clay loam	7.4 - 7.8	NA -	NA -
1,B21t,B25	- 39	CL	clay loam	7.4 - 7.8	NA -	NA -
C	39 - 60	CL	clay loam	7.4 - 8.4	NA -	NA -

pH classes: 3.5-4.4 extremely acid; 4.5-5.0 very strongly acid; 5.1-5.5 strongly acid; 5.6-6.0 moderately acid; 6.1-6.5 slightly acid; 6.6-7.3 neutral; 7.4-7.8 slightly alkaline; 7.9-8.4 moderately alkaline; 8.5-9.0 strongly alkaline; >9.0 very strongly alkaline.

Salinity classes (if applicable): 0-2 non saline; 2-4 very slightly saline; 4-8 slightly saline; 8-16 moderately saline; >=16 saline.

CHAPTER 4

LAND USE AND AIR QUALITY

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CHAPTER 4

LAND USE AND AIR QUALITY

410 LAND USE

This section of the permit application includes descriptions of the premining and proposed postmining land use(s). Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2004.

411 Environmental Description

A statement of the conditions and capabilities of the land to be affected by coal mining and reclamation operations follows in this section.

411.100 Premining Land Use

The permit area has been primarily utilized as rangeland for livestock and wildlife habitat. Some crops related to the livestock industry have been developed along the creek bottoms adjacent to Soldier Creek Road. However, no crops have been raised within the permit area. Recreational use of the permit area is limited due to lack of access through private property.

The predisturbed area boundary outlined on Plate 5-4 reflects disturbance prior to 1965. The boundary was compiled from a 1980 map of the pre-mining topography prepared by Eureka Energy Company. According to historical data the Dugout Canyon area was last mined in 1964.

Pace Canyon

Archaeological inventories in the area were completed in 1980 by AERC who surveyed the access road into Pace Canyon to the Snow Mine site which is the currently proposed location of the fan site facility. The proposed fan site does not encompass the mine itself, but merely the facility area associated with the Snow Mine. The Snow Mine (42CB292) facility was active in 1906 but had its primary production period from 1932 - 1940. When inventoried the site was in moderately fair condition and avoidance was recommended in the 1980 inventory, however the site was not recommended for nomination to the National Register of Historic Places (Hauck &Weder: 1980). During an inventory by Senco-Phenix in 2001 the BLM requested a second evaluation of the Snow Mine site utilizing current National Register of Historic Places (NRHP) criteria. Senco-Phenix recommendation was "the area has been heavily logged since the initial recordation and the area around the mine extensively disturbed by heavy equipment, probably dozed. The foundation has been destroyed and the coal loadout has been collapsed and pushed into the bed of Pace Creek. The rock-covered adit and adjacent stonewall are still there on the other side of Pace Creek (east).....Other than recent trash no artifacts were observed. The integrity of the site has been basically destroyed. The site is not recommended for the NRHP" (Senulis: 2001). The 2001 evaluation also stated "no historic properties will be affected and no further cultural resource inventory is necessary".

In October 2003, Senco-Phenix performed an additional survey of the Snow Mine area in conjunction with a exploration drilling project proposed and approved by the BLM in 2003. The surveys mentioned in this section are on file with the BLM an/or in the Confidential Binder.

411.110 Land Use Map

Plate 4-1 designates the prominent land uses within and adjacent to the permit boundary

411.120 Land Capability

The area surrounding Dugout Canyon supports a variety of land uses including industrial, agricultural, and recreational. Carbon County has zoned the permit area for mining and grazing.

Energy resource development occurs throughout the region in the form of coal mining, oil and gas production and tar sands development. A methane gas recovery operation was formerly running in conjunction with the Soldier Canyon Mine which lies west of the Dugout Canyon Mine permit boundary. The Soldier Canyon Mine has been in operation since 1976.

The major plant communities in the Dugout Canyon lease area are identified in Section 321. No cultivated lands lie within the permit boundary, due to the limiting terrain and lack of water for irrigation. Refer to Section 321.100 for forage production per acre.

The permit area is used for grazing cattle, but sheep have grazed in the area previously. Valley bottoms receive little grazing due to their limited forage and narrowness except in the vicinity of water sources. Steep slopes receive limited grazing pressure from livestock because of the steep inclines and the lack of water. Flatter mesa tops and rolling terrain receive heavier pressure because of easier movement by livestock and more available forage. Grasses are preferred forage for cattle; however, cattle will eat forbs and shrub species.

The use of land for grazing is dictated by the condition of and access to the specific areas. At the land owners discretion land may be used for grazing one year and not used again for five years. However, grazing should continue to be considered a potential land use for the permit and adjacent areas.

The permit area supports limited recreation due to inaccessibility to privately owned lands.

411.130 Land Use Description

The permit area lies within undeveloped lands used primarily as wildlife habitat and for livestock grazing. Five grazing allotments are located in or adjacent to the permit area (Plate 4-1). The allotments support 429 head of cattle from May through October. The grazing allotments as listed below are administered by the U. S. Bureau of Land Management (BLM): Pine Canyon Allotment No. 24089 supports 50 head of livestock, Dugout Allotment No. 34039 supports 60 head, Pole Canyon Grazing Allotment No. 34092 supports 144 head, Cow Canyon Allotment No. 34032 supports 95 head, and Pace Canyon Allotment No. 24085 supports 80 head of livestock. The grazing allotment within the vicinity of the fan portal facilities is the Pace Canyon Allotment No. 24085, both the existing road and proposed facility site occur within this allotment. The existing Pace Canyon road passes near the main watering sources and holding corral for livestock on this allotment.

Recreation in the permit and adjacent areas includes camping, hunting, and hiking from Spring to late Fall. Recreational use is light due to restricted access to privately-owned lands. There are no developed or inventoried recreation campgrounds within the permit boundary. No impact is expected to the current recreational uses of the area. SCM will preserve these uses into the postmining period.

During deer and elk hunting seasons, the accessible lands are used extensively by the public. Fishing is limited at best, with restricted access and no known game fish populations existing in the permit area streams.

Logging operations completed in 1996 by Cascade Resources within and adjacent to the permit boundary are shown on the Sale Area Map "Exhibit A" in Appendix 4-2. Exhibit A was prepared by Cascade Resources of Wellington, Utah who estimated harvesting six million board feet from the areas designated on the exhibit. Their logging contract expired on 12/31/96.

Timber within the disturbed area is very limited and therefore not economical for recovery by the logging industry. Exhibit B included in Appendix 4-2 shows SCM's timber inventory including areas logged and areas yet to be logged.

The nearest crop production (alfalfa) is approximately 4 miles southwest of the permit boundary adjacent to the Soldier Creek Road. Cultivation occurs on a year to year basis, depending upon the water available for irrigation.

411.140 Cultural and Historic Resources Information

Cultural resource information and maps identifying cultural and historical study areas are located within the confidential folder of information pertaining to this permit. An intensive cultural resource evaluation of the permit area has been conducted by Dr. Richard Hauck, Ph.D. of Archeological-Environmental Research Corporation (AERC). As part of this evaluation he also made a record search at the State Historic Preservation Office (SHPO) and the National Register of Historic Places (NRHP).

Cultural resource evaluations were performed on two sites within the permit boundary. Field evaluations on the historic Dugout Creek Mine (42CB 205/291) and on a prehistoric rock art site (42CB 92) were conducted by the AERC staff on November 20 - 22, 1995. Site 42CB 92, situated in the SE1/4 of Section 22, T13S, R12E, contains a series of pictograph panels first documented by Dale Berge in 1977. The historic Dugout Creek Mine locus is situated in the NW1/4 of Section 23.

The historic components of the Dugout Creek Mine (42CB 205/291) are not considered to be significant and do not need to be avoided or mitigated prior to the development of the mine site. The prehistoric rock art site (42CB 92) is a significant resource and is eligible for nomination to the NRHP. Site 42CB 92 has been reported to the NRHP and BLM offices during previous cultural and historical studies of the area in 1977, 1980, and 1995 but is not currently listed on the NRHP.

The rock art panels are unstable and could be destroyed if blasting for road expansion is done within a 600-foot radius of the panels. SCM will make every effort to protect these rock art panels without drawing unnecessary attention to their location. The panels have been preserved primarily because the general public does not know of their existence. SCM will strive to maintain this condition.

The AERC report provides descriptive and valuational information for the two sites.

Cultural and historical inventories associated with the SITLA lease tract and adjacent areas are located in Appendix 4-1 and 4-3. This information should be held confidential by the Division.

The information in Appendix 4-3 was collected starting in 1980 and the last report was completed in 2003. According to information collected from the Price office of the BLM on March 23, 2004 and conversations with Mr. David Miller, there were no sites with artifacts considered for registration found in the areas surveyed and reported in 1980 through 1991. The conclusions were the same in the surveys conducted in 2001 - 2003. A letter from John Senulis, Archeologist with Senco Phenix detailing their file search and surveys of the area has been incorporated into Appendix 4-3. The letter is addressed to Kenny Wintch, the SITLA Archeologist and a copy has been sent to Mr. Dykman at SHPO. The letter states " No sites eligible for nomination to the National Register of Historic Places have been found in or adjacent to the permit expansion area. It is very unlikely that future survey will reveal sites eligible.....Furthermore all activity will be underground with no surface disturbance. For these reasons a finding of "no effect on historic properties" is appropriate and archeologic clearance without stipulations is recommended."

Cultural and Historic Resource Maps. Maps and photographs for the evaluated cultural and historical sites are contained in the confidential folder.

There are no cemeteries, public parks, or units of the National System of Trails or the Wild and Scenic Rivers System located within the Dugout Canyon Mine permit boundary. The National Register of Historic Places was consulted by AERC and no registered historic or prehistoric properties will be affected by the proposed mine development.

SCM agrees to notify the Division and SHPO of previously unidentified cultural resources discovered in the course of mining operations. SCM also agrees to have any such cultural resources evaluated in terms of NRHP eligibility criteria. Protection of eligible cultural resources will be in accordance with Division and SHPO requirements. SCM will also instruct its employees that it is a violation of federal and state laws to collect individual artifacts or to otherwise disturb cultural resources.

Coordination with State Historic Preservation Officer. AERC contacted SHPO concerning the Dugout Canyon Mine site and a copy of their report was forwarded to SHPO. The National Register of Historic Places was consulted by AERC and no registered historic or prehistoric properties will be affected by the proposed mine development.

411.200 Previous Mining Activity

Coal mining has occurred within Dugout Canyon since 1925. D. J. Collins prospected for and initially hand-developed the Red Glow Mine in the Gilson seam on the east side of Dugout Canyon in 1925. The west side of Dugout Canyon was first mined in 1952 by E.S.O. Coal Company when they mined the Rock Canyon seam.

The Knight Ideal Coal Company mined the Rock Canyon and Gilson coal seams located on both sides of the canyon between 1958 and 1964. Knight Ideal Coal Company extracted 1,326,000 tons of coal by conventional room and pillar method with partial pillar recovery. The area in Dugout Canyon disturbed by mining has changed hands through the years but no coal has been extracted since 1964.

Limited exploration within existing portals was conducted by Pacific Gas and Electric in 1979 and by Sunedco in 1982. Following each exploration, the portals were resealed with earthen fill. During 1995, SCM reopened four portals, two on the east and two on the west side of Dugout Canyon. The portals on the east side were resealed but the portals on the west side were left open and fenced for security and safety.

Remnants of the Fish Creek and Pace Canyon Mine which operated in the early 1900's also exist within the permit boundary. Both mine sites have been considered for preservation by SHPO but were ineligible for nomination to the National Register of Historic Places. Pace Canyon contains the remains of earlier mining, disturbance by logging activities, and road access disturbance. The area was neither reclaimed or revegetated following the aforementioned disturbance.

412 Reclamation Plan

412.100 Postmining Land Use Plan

All uses of the land prior to mining and the capability of the land to support prior alternate uses will remain available throughout the life of the mine except within the disturbed-area boundary.

SCM intends the postmining land use to be consistent with the present land use, which is livestock grazing and wildlife habitat. Final reclamation activities such as grading and seeding as detailed within this M&RP will be completed in a manner to provide lands able to parallel the premining land use. In areas where surface disturbance will result from mining operations, soil reclamation and revegetation will restore the areas to wildlife habitat and livestock grazing capabilities.

The activities associated with the mining operation will follow accepted standards or proven techniques. Erosion hazards will be minimized and, where possible, eliminated. Evidence of abandoned improvements will be removed. Reclamation will restore the land and vegetation to as near a natural and productive condition as possible.

Efforts to restore wildlife habitat are discussed in Chapter 3 of this M&RP. Specific periods of habitation by wildlife species of the disturbed and adjacent area are discussed in Appendices 3-2 and 3-3. Since the disturbed area is privately owned the timing and extent of use for grazing will be made after reclamation by the landowner.

412.200 Land Owner or Surface Manager Comments

The land surface within the permit boundary is owned by various entities, including the State of Utah and Canyon Fuel Company, LLC (CFC). The disturbed area is on surface lands owned by both CFC , BLM and the State.

The leases contained in Appendix 1-1 list responsibilities accepted by CFC in regard to the State of Utah's lands within the permit boundary. The leases contain requirements concerning use and maintenance of their administered lands. CFC is obligated by these leases to notify the Division for their determination as to whether this mining operation will be detrimental to the State of Utah's interest. By submitting this M&RP, CFC is indicating that the operation will not be detrimental to the State's interests and the obligation is being met. A letter of affirmation from the State of Utah concerning proposed land use is included in Appendix 4- 2.

The Bureau of Land Management (BLM) Right-of-Way application (UTU-76601) in Appendix 1-3 lists the responsibilities accepted by CFC concerning the BLM lands included in the permit boundary. A letter from the BLM concerning proposed land use will be included in Appendix 4-2.

Refer to Chapter 1 for responsibilities CFC accepts in association with Federal Lease U-07064-027821.

For clarification as to relationship of SCM to CFC, refer to Section 112.

412.300 Suitability and Capability

Final fills will not contain excess spoils.

413 Performance Standards

The performance standards for the areas to be reclaimed for postmining land use are contained in this section.

413.100 Postmining Land Use

Postmining land uses are discussed in Section 412.100. The postmining lands will be reclaimed in a timely manner and capable of supporting such land uses (see Chapters 2, 3, 5, and 7). The postmining roads are discussed in Section 542.600.

413.200 Determining Premining Uses of Land

Postmining land uses will be as stated in Section 412.

413.300 Criteria for Alternative Postmining Land Uses

No alternative postmining land uses have been planned.

414 Alternative Land Use

No alternative postmining land uses have been planned.

420 AIR QUALITY

This section includes descriptions of plans to comply with the Clean Air Act and applicable Utah or federal statutes and regulations pertaining to air quality standards.

Dugout Canyon Mine (called the Sage Point-Dugout Canyon Mine under previous ownership by Eureka Energy Company) was granted a PSD permit by EPA on December 17, 1979. On February

12, 1982 the EPA approved air quality regulations adopted by the State of Utah. Subsequently, an Approval Order (AO) was issued on September 28, 1983 by the Utah Air Conservation Committee for the Sage Point-Dugout Canyon Mine. However the planned mining operations were never implemented.

Information collected for the PSD and the 1983 AO have been submitted to the Utah Division of Air Quality in a request for an amended approval order. This amendment was requested because of a change in surface equipment and a decrease in proposed coal removal from 5.2 million tons to 2 million tons per year.

421 Air Quality Standards

Dugout Canyon's mining activities will be conducted in compliance with the requirements of the Federal Clean Air Act and the Utah Air Conservation Rules.

422 Compliance Efforts

No mining activities will be conducted without a current AO from the Utah Division of Air Quality (DAQ). All activity will be conducted in compliance with the conditions established in the AO. A Notice of Intent (NOI) to construct has been submitted in accordance with DAQ document "Preparing Your Notice of Intent". Preconstruction conferences will be held as required by DAQ personnel. Emissions will be estimated using procedures and factors supplied by DAQ. A copy of the Approval Order and supporting information can be found in Appendix 4-1.

423 Monitoring Program

An NOI will be submitted to DAQ requesting approval for a production rate of 2 million tons per year. This rate exceeds immediate production plans, but approval at this level will preclude the necessity of reapplying if future production plans should increase. This approach is appropriate since an AO is subject to specific operating conditions rather than to a time period and thus does

not expire at the end of a 5-year period as does the approval of the mining permit. If operating conditions change sufficiently to invalidate the AO, a new NOI will be prepared.

The operating conditions are specified in the NOI and form the basis of the AO. All monitoring requirements and fugitive dust control practices as established by the AO will be followed by SCM. Should additional requirements be established under the provisions of R645-301-244.100 or R645-301-244.300, these requirements will also be followed by SCM.

424 Fugitive Control Plan for Production Rates Less than One Million Tons Per Year

During startup, or other situations where production is less than one million tons per year, the same procedures established in Section 423 will be followed and will be subject to the conditions of the AO issues by DAQ. See Section 523 of this M&RP for coal extraction estimates for the first 5 years of mining.

425 Additional Division Requirements

Should an air quality monitoring program be required by the Division while operating at a production rate of less than one million tons per year, SCM will provide sufficient data to judge the effectiveness of the fugitive dust control plan.

REFERENCES:

Berge, D. L., 1976. The archaeological potential of the sage point coal mine, surface facilities and railroad spur, central Utah.

Division of Air Quality, 1994. Preparing Your Notice of Intent, Fifth Edition.

Hauck, F.R. and Dennis G. Weder, 1980. Intensive archeological surface evaluations of the proposed Sage Point-Dugout Canyon project in Carbon County, UT. Archeological Environmental Research Corporation paper No. 19. Salt lake city, UT.

Julander, 0. 1955. Deer and cattle range relations in Utah. Forest Science 1 (2):130-139.

APPENDIX 4-3

Cultural and Historical Studies

SITLA Lease and Adjacent Area

~~**INFORMATION IN APPENDIX 4-3 SHOULD BE PLACED IN A CONFIDENTIAL LOCATION**~~

REFERENCE CONFIDENTIAL FOLDER PER REQUEST UNDER TASK ID # 1915

SENCO-PHENIX

AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE 2003 DUGOUT CANYON MINE PACE CANYON EXPLORATION DRILL HOLES BLOCK AREA AND ACCESS ROAD

BLM/Private Lands

Carbon County, Utah

PERFORMED FOR
Dugout Canyon Mine of
Canyon Fuel Company, LLC

In Accordance with BLM and
Utah State Guidelines
Antiquities Permit #U03SC841bp

SPUT-463
October 8, 2003

John A. Senulis

Direct Charge of Fieldwork

UTAH SHPO

COVER SHEET

Project Name: **AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE 2003 DUGOUT CANYON MINE PACE CANYON EXPLORATION DRILL HOLES BLOCK AREA AND ACCESS ROAD**

Dugout Canyon Mine of Canyon Fuels LLC.

State #U03SC0841bp

Report Date: October 8, 2003 County (ies): Carbon

Principal Investigator/ Field Supervisor: John A. Senulis/John Senulis

Records Search/Location/Dates: September 19, 2003, Price River Field Office of the BLM

Acreage Surveyed: 13 acres

Intensive Acres: 13 Recon/Intuitive Acres: 0

U.S.G.S. 7.5 Quad: Pine Canyon, Utah (1972), Mount Bartles, Utah (1972)

Sites Reported	Number	Smithsonian Site #(s):
Archeological Sites:	1	42CB1998
Revisit (No IMACS update)	0	
Revisit (IMACS update attch.)	0	
New Sites (IMACS attached)	1	42CB1998
Archeological Site Total:	0	
Historic Structures:		
(USHS Site Form Attached)		
Total NRHP Eligible Sites,	0	

Checklist of Required Items:

1. X 1 Copy of Final Report
2. X Copy of U.S.G.S. 7.5' map showing surveyed/excavated area
3. Completed IMACS Site Inventory Forms Including
   - X Parts A and B or C
   - X IMACS Encoding Form
   - X Site Sketch Map
   - X Photographs
   - X Copy of USGS 7.5' Quad with Smithsonian site Number
4. X Completed Cover Sheet

U.S. Department of the Interior
Bureau of Land Management
Utah State Office
Summary Report of
Inspection for Cultural Resources

For BLM Use Only

BLM Report ID No. ☐☐☐ ☐☐☐☐☐☐☐☐
1 4 10

Report Acceptable Yes☐ No☐
Mitigation Acceptable Yes☐ No☐
Comments:

Report Title: **AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE 2003 DUGOUT CANYON MINE PACE CANYON EXPLORATION DRILL HOLES BLOCK AREA AND ACCESS ROAD**

2. Development Company: Dugout Canyon Mine of Canyon Fuel LLC

3. Report Date: October (month) 8, (W) 2003 (year)

4. Antiquities Permit: No.U03SC0841bp
BLM 03UT54633

5. Responsible Institution: SENCO-PHENIX County: Carbon

6. Fieldwork Location:

Section 30, T13S, R13E

7. Resource Area: Price River Field Office

PO=Pony Express, BR=Bear River, PR=Price River, WS=Warm Springs
BC=Book Cliffs, HR=House Range, Sevier River, HM=Henry Mountains
BE=Beaver River, DX=Dixie ,KA=Kanab, ES=Escalante, SJ=SanJuan
GR=Grand, SR=San Rafael, DM=Diamond Mountain

V=Vernal Meridian
H=Half Township

8. Description of Examination Procedures:

Literature Review

9. Linear Miles Surveyed: 0
and/or
Definable Acres Surveyed 0
and/or
Undefinable Acres Survey 0

10. Inventory Type: I

R=Reconnaisance
I=Intensive
S=Statistical Sample

11. Description of Findings (attach appendices, if appropriate) 12. Number of Sites: 2 13. Collection: N Y=Yes, N=No

Previously recorded 42CB292
Newly recorded: 42CB1998

14. Actual/Potential National Register Properties Affected:

None

15. Literature Search, Location(s)/Date(s):

September 19, 2003, Price River Field Office of the Bureau of Land Management.

16. Conclusions/Recommendations:

Archeological clearance

17. Signatures

Administrator:

Field Supervisor: John A. Senulis

*For extra locationals use additional 8100-3 forms.

UT 8100-3 (2/85)

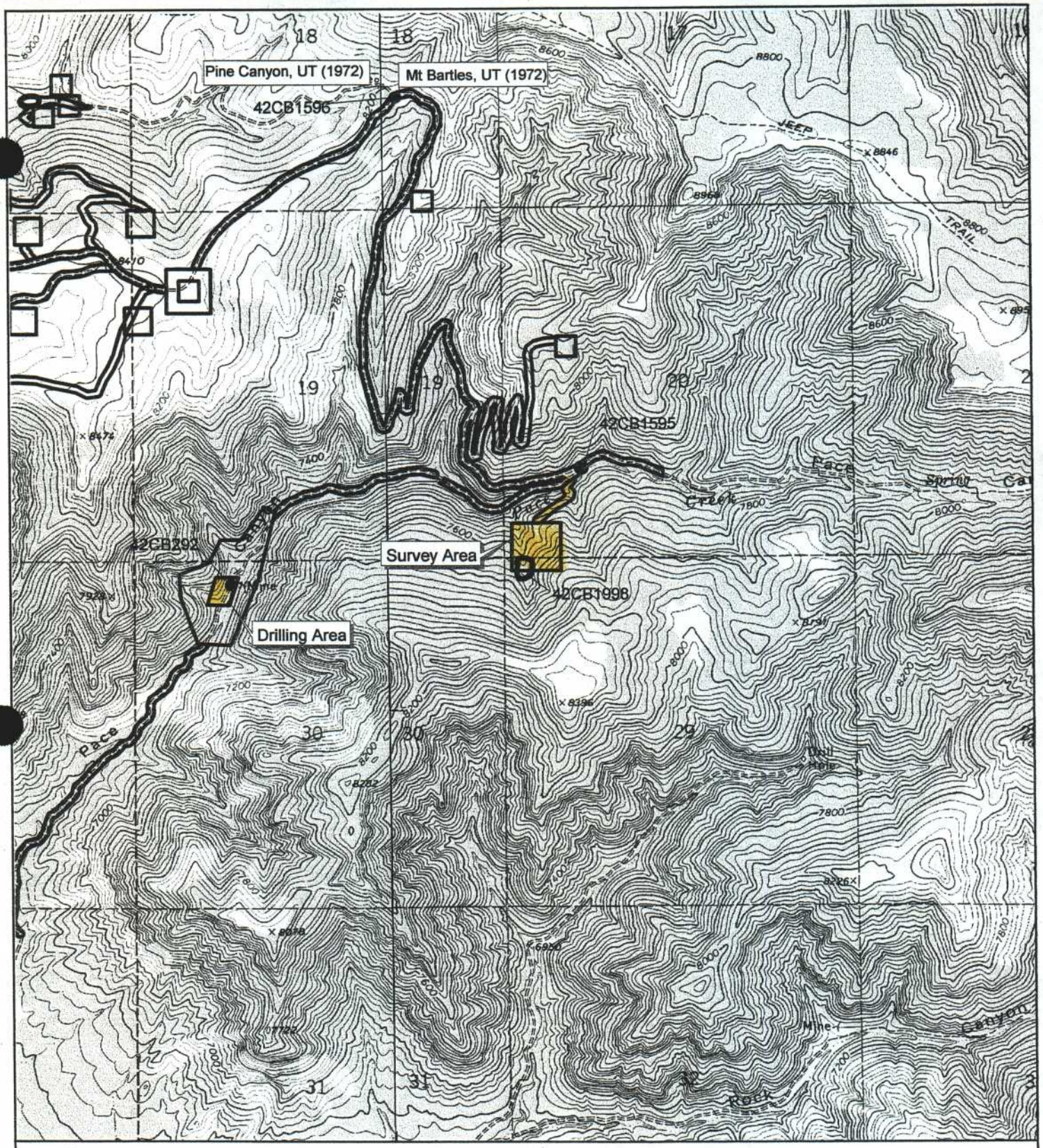
Abstract

SENCO-PHENIX performed an intensive cultural resource survey and literature review for two proposed drilling areas for the Dugout Canyon Mine of Canyon Fuel LLC. The first portion of the project is on BLM land in an area previously surveyed by AERC (1980). This area contains one archeological site 42CB292 the old Snow Mine. That site was re-recorded by SENCO-PHENIX (2001) and found to be not eligible for the National Register of Historic Places because of extensive surface disturbance. The BLM portion of the proposed project, in Section 30, T13S, R13E, will need no further archeological survey and archeological clearance is recommended. The previous work is more fully documented in a letter from SENCO-PHENIX to Vicky Miller of Canyon Fuel LLC (2003 attached). The second proposed drilling area and access road are located on private land in Sections 20 and 29, T13S, R13E. That area was surveyed to identify and evaluate cultural resources that may exist within the project area.

Cultural resources were located in the form of one historic archeological site:

> **42CB1998**: The site is a mid to late twentieth century temporary sawmill site. A portable sawmill was set up on the site and then moved when the logging operations were finished. The remains include 3 slash piles of partially milled lumber of logs that were too small to mill. There are small features that may have been associated with portable buildings or tents. These include 3-4" by 6" logs that may have been a tent base and a small stack of 2 x 4s and 2 x8s. There was an aspen tree board ladder beside the 3 logs. It consisted of 2 x 1x 14 inch boards nailed onto an aspen tree, some of the boards were becoming embedded in the tree. There are very few artifacts on the site and some may be from subsequent herding activities. Several two-track logging roads pass through the site. The predominant artifacts are sanitary and evaporated milk tin cans and fragments of clear and brown glass but also a fragment of an automobile car seat, a chainsaw blade guide, an aluminum squeeze tube, and an "Argentina" potted meat can. Some of the clear glass fragments are from "Kerr" canning jars. The site is located on a terrace above an intermittent drainage of Pace Creek. Soils are light tan sandy clay loam with gravels. Vegetation includes a regenerating plant community consisting of a mixed conifer forest with white pine, cottonwood, aspen, willow, mountain mahogany, serviceberry, maple, scrub oak, pinyon-juniper, low sagebrush, grasses and forbs. The major portion of the site has been removed; there is little potential for further information. The site is not considered eligible for the NRHP.

No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended.



SENCO-PHENIX

N

Scale 1:24,000
1"= 2,000'

Current Survey

Previous Survey

Eligible Sites

Ineligible Sites

Pace Canyon Drilling Program
Dugout Mine of Canyon Fuel, LLC
Carbon County, Utah
Sections 20, 29, 30, T13S, R13E
September 2003
SPUT-463

Project Location

The project consists of a ten-acre block in which Canyon Fuel will drill several drill holes within the block. The block unit was chosen to give the company ability to vary the locations if needed. The project area is in the SW/SW ¼ of section 20 and the NW/NW ¼ of Section 29, both T13S, R13E, Carbon County, Utah. Access to the project area will mostly follow an existing ca. 1,100-foot two-track dirt road that was built to facilitate logging in the general area. The proposed drill holes were flagged. The proposed project is noted on the enclosed copy of U.S.G.S. Composite 7.5' Quad: Pine Canyon, Utah (1972) and Mount Bartles, Utah (1972).

Environment

The project area is within the Pace Creek drainage. The site is located on a terrace above an intermittent drainage of Pace Creek. Soils are light tan sandy clay loam with gravels. Vegetation includes a regenerating plant community consisting of a mixed conifer forest with white pine, cottonwood, aspen, willow, mountain mahogany, serviceberry, maple, scrub oak, pinyon-juniper, low sagebrush, grasses and forbs.

Previous Research

A file search by John Senulis of SENCO-PHENIX at the Price River Field Office of the BLM on September 19, 2003 revealed that the following projects are reported for the current project area:

- 1980, AERC surveyed several sample blocks in Sections 13 and 24, T13S, R12E and Sections 18, 19 and 30 T13S, R13E. They also surveyed the access road into the Snow Mine site. One archeological site was located:
    - 42CB292 The site was described as "Coal mine located in Pace Canyon consists of one known mine portal which has been closed. Site of historic Snow Mine in Pace Canyon which was active in 1906 but had its primary production period from 1932-1940." The site was relatively pristine at the time and still contained a standing coal loadout and foundation with depth potential. Avoidance was recommended pending further historic research. As noted the site has since been extensively modified.
- 2001, SENCO-PHENIX surveyed several drill holes and an extensive series of roads. Two new sites were recorded and one previously recorded site was re-recorded:
    - 42CB292 The site was the historic Snow Mine in Pace Canyon, which was active in 1906 but had its primary production period from 1932-1940. The area has been heavily logged since the initial recordation and the area around the mine extensively disturbed by heavy equipment, probably dozed. The foundation has been destroyed and the coal loadout has been collapsed and pushed into the bed of Pace Creek. The rock-covered adit and adjacent stonewall are still there on the other side of Pace Creek. There are two 6 x 10 dugouts used as coal loadouts on the west side of the road. Other than recent trash no artifacts were observed. The integrity of the site has been basically destroyed. The site was not recommended for the NRHP.
    - 42CB1595 was a small wood framed one-room cabin that was probably related to the logging industry. It was not recommended for nomination to the NRHP.
    - 42CB1596 was a corral and Aspen art site. It was not recommended for nomination to the NRHP.

Methodology

John and Jeanne Senulis of SENCO-PHENIX performed a Class III intensive walkover survey on September 23, 2003. Meandering transects no further spaced than 15 meters were employed for the ten-acre block area. The access road was surveyed to a right of way of 30 meters except where the two-track joins the Pace Canyon road, which was surveyed to a width of 150 feet. Special attention was given to those areas of subsurface soil exposure from animal burrowing and erosion. When the site was located the artifacts were pinflagged and the site was photographed. The sites were plotted using a WAAS enabled GPS unit. The readings were then transferred to the ARCVIEW mapping program as a permanent database.

All field notes and digital photographs are on file at the offices of SENCO-PHENIX in Price, Utah.

Findings and Recommendations

Cultural resources were located in the form of one historic archeological site:

> **42CB1998**: The site is a mid to late twentieth century temporary sawmill site. A portable sawmill was set up on the site and then moved when the logging operations were finished. The remains include 3 slash piles of partially milled lumber of logs that were too small to mill. There are small features that may have been associated with portable buildings or tents. These include 3-4" by 6" logs that may have been a tent base and a small stack of 2 x 4s and 2 x8s. There was an aspen tree board ladder beside the 3 logs. It consisted of 2 x 1x 14 inch boards nailed onto an aspen tree, some of the boards were becoming embedded in the tree. There are very few artifacts on the site and some may be from subsequent herding activities. Several two-track logging roads pass through the site. The predominant artifacts are sanitary and evaporated milk tin cans and fragments of clear and brown glass but also a fragment of an automobile car seat, a chainsaw blade guide, an aluminum squeeze tube, and an "Argentina" potted meat can. Some of the clear glass fragments are from "Kerr" canning jars. The site is located on a terrace above an intermittent drainage of Pace Creek. Soils are light tan sandy clay loam with gravels. Vegetation includes a regenerating plant community consisting of a mixed conifer forest with white pine, cottonwood, aspen, willow, mountain mahogany, serviceberry, maple, scrub oak, pinyon-juniper, low sagebrush, grasses and forbs. The major portion of the site has been removed; there is little potential for further information. The site is not considered eligible for the NRHP.

No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended.

These recommendations are subject to modification and review by the BLM Field Office Manager and the Utah SHPO.

References

Hauck, F. R. & D. G. Weder

1980 *Intensive Archeological Surface Evaluation of the Proposed Sage Point-Dugout Canyon Project in Carbon County, Utah*, Archeological-Environmental Research Corporation Paper Number 19, Salt Lake City, (Utah Antiquities # 80-67).

Senulis, John A.

2001 *An Intensive Cultural Resource Survey and Inventory of the Dugout Canyon Mine Drill Holes and Access Roads*, SENCO-PHENIX Archeological Consultants, Price, Utah. (Utah Antiquities # 01-240)

SENCO-PHENIX

September 25, 2003

Ms. Vicky Miller
Soldier Canyon Mine of Canyon Fuel, LLC
P.O. Box 1029
Wellington, UT 84542

Dear Vicky,

Enclosed is a map showing the location of your proposed drilling activities in the NE ¼ of Section 30, T13S, R13E, Carbon County, Utah. You will note that the area surrounding the proposed drilling program is labeled "Previous Survey." In 1980 AERC surveyed several sample blocks in Sections 18, 19 and 30 T13S, R13E. They also surveyed the access road into Pace Canyon to the Snow Mine site (42CB292). The site was the historic Snow Mine in Pace Canyon, which was active in 1906 but had its primary production period from 1932-1940. The site was in moderately fair condition in 1980 and still contained a standing coal loadout and a foundation with depth potential. Avoidance was recommended pending further historic research, although the site was not recommended for nomination to the National Register of Historic Places (NRHP) (Hauck & Weder: 1980).

When SENCO-PHENIX did the cultural resource inventory for Canyon Fuel's 2001 drilling program we were asked by the BLM to evaluate the Snow Mine utilizing current NRHP criteria. Our recommendation was "The area has been heavily logged since the initial recordation and the area around the mine extensively disturbed by heavy equipment, probably dozed. The foundation has been destroyed and the coal loadout has been collapsed and pushed into the bed of Pace Creek. The rock-covered adit and adjacent stonewall are still there on the other side of Pace Creek. There are two 6 x 10 dugouts used as coal loadouts on the west side of the road. Other than recent trash no artifacts were observed. The integrity of the site has been basically destroyed. The site is not recommended for the NRHP" (Senulis: 2001).

The AERC block survey did not find any other cultural resources other than 42CB292. Site 42CB292 is not eligible for the NRHP, therefore, no historic properties will be affected and no further cultural resource inventory is necessary prior to your drilling

program. Archeological clearance is recommended without additional archeological work.

If we can be of additional help please do not hesitate to contact us.

Sincerely,

John A Senulis
Principal Investigator

Jas: bhoh

Attachment

References

Hauck, F. R. & D. G. Weder

1980 *Intensive Archeological Surface Evaluation of the Proposed Sage Point-Dugout Canyon Project in Carbon County, Utah*, Archeological-Environmental Research Corporation Paper Number 19, Salt Lake City, (Utah Antiquities # 80-67).

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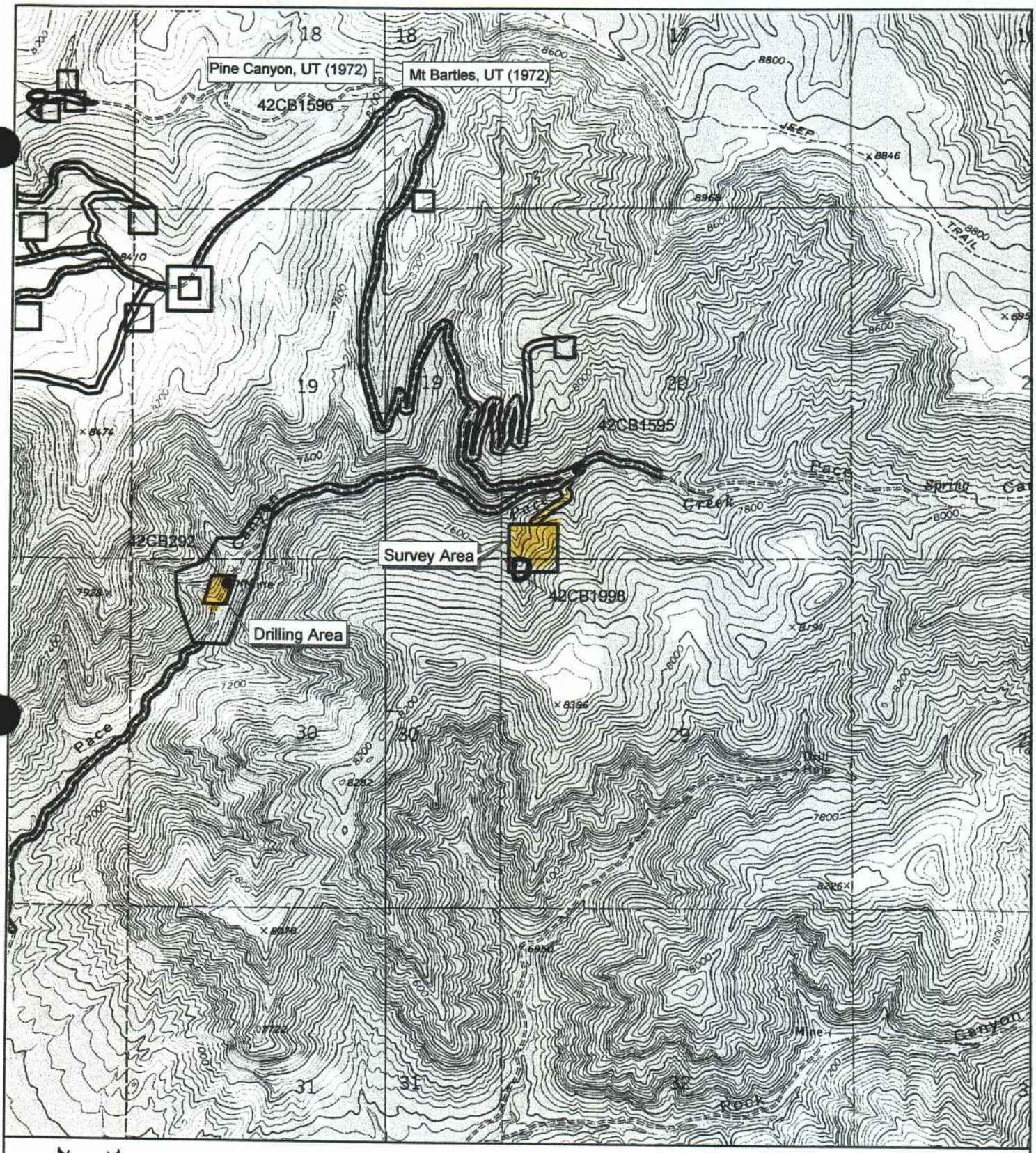
2001 *An Intensive Cultural Resource Survey and Inventory of the Dugout Canyon Mine Drill Holes and Access Roads*, SENCO-PHENIX Archeological Consultants, Price, Utah. (Utah Antiquities # 01-240)



SENCO-PHENIX

N

Scale 1:24,000
1"= 2,000'

Current Survey

Previous Survey

Eligible Sites

Ineligible Sites

Pace Canyon Drilling Program
Dugout Mine of Canyon Fuel, LLC
Carbon County, Utah
Sections 20, 30, T13S, R13E
September 2003
SPUT-463

IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by:
BLM - Utah, Idaho, Wyoming, Nevada
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

***1. State No.** 42CB1998
***2. Agency No.**
***3. Temp. No.**
County Carbon

4. State: Utah
5. Project: SPUT- 462
***6. Report No:** UT03SC0840
7. Site Name / Property Name:
8. Class ☐ Prehistoric ☒ Historic ☐ Paleontologic ☐ Ethnographic
9. Site Type: Historic sawmill site
***10. Elevation:** 7780 feet amsl
***11. UTM Grid Zone:** 12 534469 mE 4391368 mN (see #36)
***12.** NW ¼ **of** NW ¼ **of** NW ¼ **of** NW ¼ **Section:** 29, T.13S R.13E
***13. Meridian:** SLC
***14. Map Reference:** Mt. Bartles, UT (1972)
15. Aerial Photo: N/A
16. Location and Access: From Wellington, Utah, travel east on Highway 6 for ca. 7 miles. Turn left onto Pace Canyon Road. Follow the improved dirt road northerly ca. 4.5 miles to northwesterly trending dirt road. Follow that road northwesterly ca. 2.5 miles to road juncture. Park walk back 100 feet on east side of road to two-track going up mountain. Walk on two-track ca. 800 feet southwest to site.
***17. Land Owner:** Private
***18. Federal Administrative Units:** N/A
***19. Location of Curated Materials:** N/A
20. Site Description: The site is a mid to late twentieth century temporary sawmill site. A portable sawmill was set up on the site and then moved when the logging operations were finished. The remains include 3 slash piles of partially milled lumber of logs that were too small to mill. There are small features that may have been associated with portable buildings or tents. These include 3-4" by 6" logs that may have been a tent base and a small stack of 2 x 4s and 2 x8s. There was an aspen tree board ladder beside the 3 logs. It consisted of 2 x 1x 14 inch boards nailed onto an aspen tree, some of the boards were becoming embedded in the tree. There are very few artifacts on the site and some may be from subsequent herding activities. Several two-track logging roads pass through the site. The predominant artifacts are sanitary and evaporated milk tin cans and fragments of clear and brown glass but also a fragment of an automobile car seat, a chainsaw blade guide, an aluminum squeeze tube, and an "Argentina" potted meat can. Some of the clear glass fragments are from "Kerr" canning jars. The site is located on a terrace above an intermittent drainage of Pace Creek. Soils are light tan sandy clay loam with gravels. Vegetation includes a regenerating plant community consisting of a mixed conifer forest with white pine, cottonwood, aspen, willow, mountain mahogany, serviceberry, maple, scrub oak, pinyon-juniper, low sagebrush, grasses and forbs. The major portion of the site has been removed; there is little potential for further information. The site is not considered eligible for the NRHP.
***21. Site Condition** ☐ Excellent (A) ☐ Good (B) ☐ Fair (C) ☒ Poor (D)
***22. Impact Agent(s):** Dismantling, erosion, possible vandalism
***23. National Register Status** ☐ Significant (C) ☒ Non-Significant (D) ☐ Unevaluated (Z)
Justify: The major portion of the site has been removed; there is little potential for further information.
24. Photos: 42CB1998 - 1-4, SENCO-PHENIX
25. Recorded by: John Senulis
***26. Survey Organization:** SENCO-PHENIX
28. Survey Date: 9/23/03
27. Assisting Crew Members: Jeanne Senulis

List of Attachments:
☐ Part B ☒ Topo Map ☒ Photos ☐ Continuation Sheets
☒ Part C ☒ Site Sketch ☒ Artifact/Feature Sketch
☐ Part E ☐ Other

*Encoded data items

Part A - Environmental Data

*29. **Slope:** 03 (Degrees) **Aspect:** 340 (Degrees) **Site No: 42CB1998**

*30. **Distance to Permanent Water** 4 x 100 meters

Type of Water Source ☐ Spring/Seep (A) ☒ Stream/River (B) ☐ Lake (C) ☐ Other (D)

Name of Water Source: Pace Creek

*31. **Geographic Unit: Mancos Shale Lowlands**

*32. **Topographic Location**

PRIMARY LANDFORM		SECONDARY LANDFORM		
☐ Mountain Spine (A)	☐ Alluvial Fan (A)	☐ Dune (I)	☐ Slope (Q)	☐ Riser (Y)
☐ Hill (B)	☐ Alcove/Rockshelter (B)	☐ Floodplain (J)	☒ Terrace/Bench (R)	☐ Multiple Landforms (1)
☐ Tableland/Mesa (C)	☐ Arroyo (C)	☐ Ledge (K)	☐ Talus Slope (S)	☐ Bar (2)
☐ Ridge (D)	☐ Basin (D)	☐ Mesa/Butte (L)	☐ Island (T)	☐ Lagoon (3)
☒ Valley (E)	☐ Cave (E)	☐ Playa (M)	☐ Outcrop (U)	☐ Ephemeral Wash (4)
☐ Plain (F)	☐ Cliff (F)	☐ Port.Geo.(N)	☐ Spring Mound/Bog (V)	☐ Kipuka (5)
☐ Canyon (G)	☐ Delta (G)	☐ Plain (O)	☐ Valley (W)	☐ Saddle/Pass (6)
☐ Island (H)	☐ Detached Monolith (H)	☐ Ridge/Knoll(P)	☐ Cutbank (X)	☐ Graben (7)

Describe: The site is located on a terrace above a intermittent tributary of Pace Creek.

*33. **Onsite Depositional Context**

☐ Fan (A)	☐ Outcrop (Q)	☐ Moraine (J)	☐ Desert Pavement (P)
☐ Talus (B)	☐ Extinct Lake (F)	☐ Flood Plain (K)	☐ Stream Bed (R)
☐ Dune (C)	☐ Extant Lake (G)	☐ Marsh (L)	☐ Aeolian (S)
☐ Stream Terrace (D)	☒ Alluvial Plain (H)	☐ Landslide/Slump (M)	☐ None (T)
☐ Playa (E)	☐ Colluvium (I)	☐ Delta (N)	☐ Residual (U)

Description of Soil: Light tan sandy clay loam with gravels.

34. **Vegetation**

a. **Life Zone**

☐ Arctic-Alpine(A) ☐ Hudsonian(B) ☐ Canadian(C) ☐ Transitional(D) ☒ Upper Sonoran(E) ☐ Lower Sonoran(F)

b. **Community** **Primary Onsite:** G **Secondary Onsite:** Q **Surrounding Site:** G

Aspen (A)	Other/Mixed Conifer (G)	Grassland/Steppe(M)	Marsh/Swamp(S)
Spruce/Fir (B)	Pinyon-Juniper Woodland (H)	Desert Lake Shore (N)	Lake/Reservoir (T)
Douglas Fir (C)	Wet Meadow (I)	Shadscale Community (O)	Agricultural (U)
Alpine Tundra (D)	Dry Meadow (J)	Tall Sagebrush (P)	Blackbrush (V)
Ponderosa Pine (E)	Oak-Maple Shrub (K)	Low Sagebrush (Q)	Creosote Brush (Y)
Lodgepole Pine (F)	Riparian (L)	Barren (R)	

Describe: Vegetation includes a regenerating plant community consisting of a mixed conifer forest with white pine, cottonwood, aspen, willow, mountain mahogany, serviceberry, maple, scrub oak, pinyon-juniper, low sagebrush, grasses and forbs.

*35. **Miscellaneous Text:**

36. **Comments/Continuations:** also 543480 mE, 4391279 mN; 543528 mE, 4391292 mN, 543537 mE, 4391362 mN.

Part C - Historic Sites

Site No: 42CB1998

1. Site Type: Historic sawmill

2. Historic Theme(s): Logging/ ranching

CULTURAL AFFILIATION	DATING METHOD	CULTURAL AFFILIATION	DATING METHOD
3. Culture: European/ American	General cross-dating		

Describe: Known logging operations,

4. Oldest Date: 1940's **Recent Date:** 1960's

How Determined: General cross-dating.

5. Site Dimensions: 60 **m X** 60 **m** **Area:** 2826 **sq m**

6. Surface Collections Method
- ☒ None (A)
- ☐ Grab Sample (B)
- ☐ Designed Sample (C)
- ☐ Complete Collection (D)

Sampling Method: N/A

7. Estimated Depth of Cultural Fill
- ☒ Surface (A)
- ☐ 0-20 cm (B)
- ☐ 20-100 cm (C)
- ☐ 100 cm + (D)
- ☐ Fill noted but unknown (E)
- ☐ Depth suspected, but not tested (F)

How Estimated: Observation.
(If tested, show location of site map)

8. Excavation Status
- ☐ Excavated (A)
- ☐ Tested (B)
- ☒ Unexcavated (C)

Testing Method: N/A

9. Summary of Artifacts and Debris

☒ Glass (GL)	☐ Bone (BO)	☐ Leather (LE)	☐ Ammunition (AM)	☐ Domestic Items (DI)
☐ Metal (ME	☐ Ceramics(CS)	☒ Wire (WI)	☒ Wood (WD)	☐ Kitchen Utensils (KU)
☒ Nails (NC,NW)	☐ Fabric (FA)	☒ Tin Cans	☐ Rubber (RB)	☒ Car/Car Parts (CR)

Describe: The remains include 3 slash piles of partially milled lumber of logs that were too small to mill. There are small features that may have been associated with portable buildings or tents. These include 3-4" by 6" logs that may have been a tent base and a small stack of 2 x 4s and 2 x8s. There was an aspen tree board ladder beside the 3 logs. It consisted of 2 x 1x 14 inch boards nailed onto an aspen tree, some of the boards were becoming embedded in the tree. There are very few artifacts on the site and some may be from herding activities. The predominant artifacts are sanitary and evaporated milk tin cans and fragments of clear and brown glass but also a fragment of an automobile car seat, a chainsaw blade guide, an aluminum squeeze tube, and an "Argentina" potted meat can. Some of the clear glass fragments are from "Kerr" canning jars.

10. Ceramic Artifacts:

Paste	Glaze/Slip	Decoration	Pattern	Vessel Form(s)	#

a. Estimated Number of Ceramic Trademarks:
Describe: N/A

Part C - Historic Sites

Site No. 42CB1998

11. Glass:

#	Manufacture	Color	Function	Trademarks	Decoration
20	ABS	clear	bottle/canning	Kerr	N/A
10	ABS	brown	beer bottle		

Describe: Some of the clear glass fragments are from "Kerr" canning jars.

12. Maximum Density - #/sq m (glass and ceramics): 1

13. Tin Cans

Type	Opening	Size	Modified	Label/Mark	Function
Sanitary	cut around	10-30	N/A	N/A	N/A
Evaporated milk	punched	12	N/A	N/A	N/A

Describe: There were 25 rusted, deteriorated sanitary cans including 5-quart paint cans and lids and 32 oz. Juice cans. There were 12 evaporated milk cans.

14. Landscape and Constructed Features (locate on site map)

- ☒ Trail/Road (TR)
- ☐ Dump (DU)
- ☐ Dam, Earthen (DA)
- ☐ Hearth/Campfire (HE)
- ☐ Tailings (MT, ML)
- ☐ Depression (DE)
- ☐ Ditch (DI)
- ☐ Quarry (QU)
- ☐ Rock Alignment (RA)
- ☐ Cemetery/Burial (CB)
- ☐ Inscriptions (IN)
- ☒ Other (OT)

Describe: Several two-track logging roads pass through the site.

15. Buildings and Structures (locate on site map)

#	Material	Type	#	Material	Type
1	log	possible tent base			
1	combination	ladder in aspen tree			

Describe: There are small features that may have been associated with portable buildings or tents. These include 3-4" by 6" logs that may have been a tent base and a small stack of 2 x 4s and 2 x8s. There was an aspen tree board ladder beside the 3 logs. It consisted of 2 x 1x 14 inch boards nailed onto an aspen tree, some of the boards were becoming embedded in the tree.

16. Comments/Continuations - *Please make note of any Historic Record searches performed (for example - County Records, General Land Office, Historical Society, Land Management Agency Records, Oral Histories/Interviews)*

1990

IMACS ENCODING FORM

Encoder's Name J SENULIS

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

1 42CB1998 State Site Number

2 - Agency Site Number

6 Agency Report Number

10 7780 Elevation

11	Zone	Easting	Northing
	12	534469	4391368
	12	543480	4391279
	12	543528	4391292
	12	543537	4391362

A

12

1/4	1/4	1/4	Sec.	T.		R.	
NW	NW	NW	29	13	5	13	E

13 1 Merid.

14 MT BARTLES, UT (1972) USGS Map

17 PR Owner

18 Forest

J6 Dist./Park

19 NA Loc. Cur. Materials

21 D Cond.

22 ER VA DM Impacts

23 D N.R.

26 SC Organ.

28 9 - 23 - 03 Survey Date

29 03 Slope

340 Aspect

30 4 B Water: dstance/type

31 CAC Geog. Unit

32 E R 1st 2st Topographic Locatio

33 H Dep.

34 E. G Q G 1 2 3 Vegetation

35 Misc. Text, Site Name

B

2 Culture/Dating Method

3 Area

4 Collect

5 Depth

6 Excav. Status

7 Prehistoric Artifacts

8 Lithic Tools: # / type

9 # Flaking Stages

11 Ceramics: #/type

13 Features: # / type

14 Architecture: # / material / type

C

2 LG Historic Themes

3 EA F Culture/Dating Method

4 1940 1960 Dates

5 2826 Area

6 A Collect

7 A Depth

8 C Excav. Status

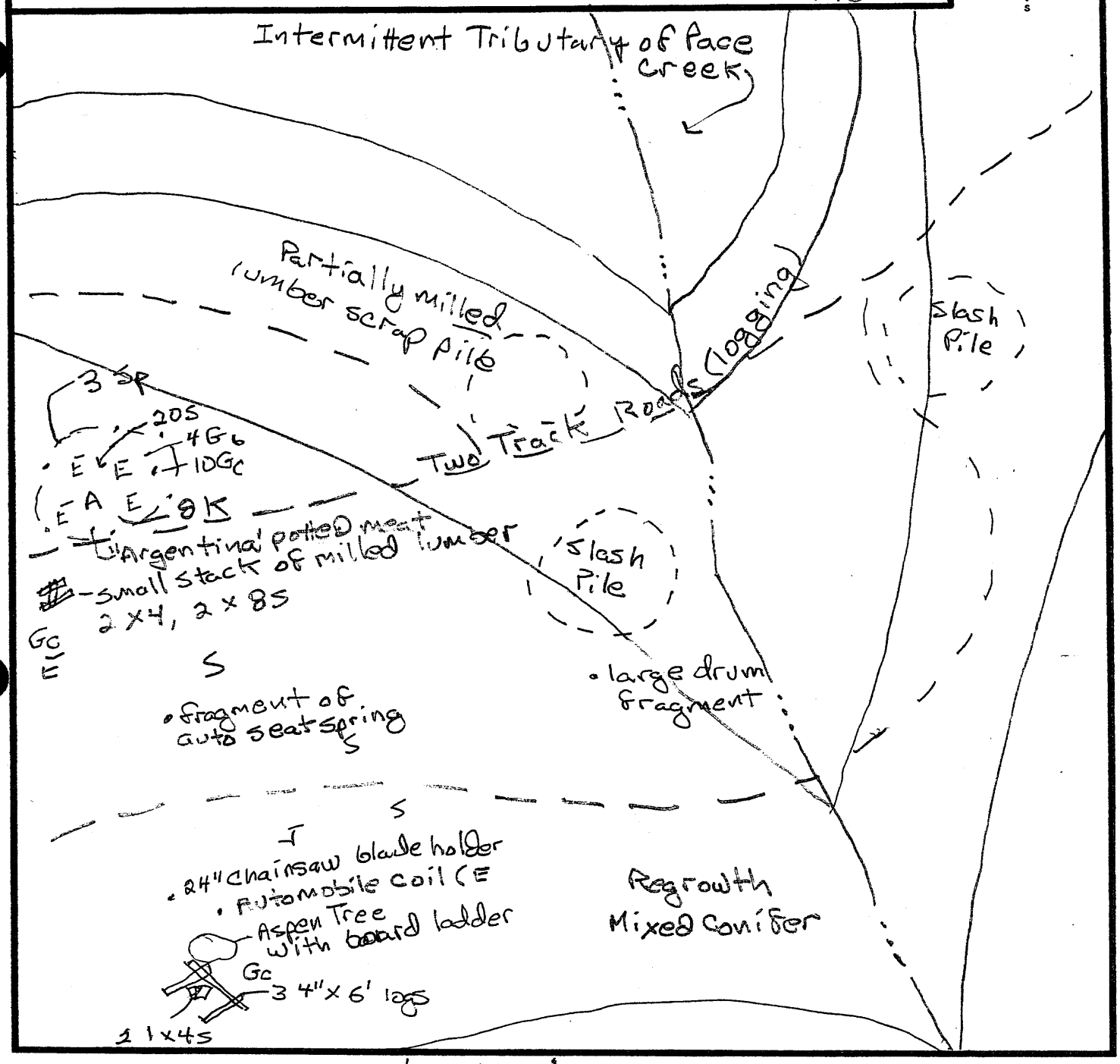
9 GL NC WI TC WD CR Artifacts

14 3 TR 1 DT Features: # / type

15 1 P BY 1 W Architecture: # / material / type

Printed on 11/13/02 3:12:29 P

Sketch Location of 42CB1998



Key

Quart Paint Cans & lids — Sp — S - Sanitary tin can - most cut around
E - Evaporated Milk can - punched opening
⊥ = 32oz ridged juice can
G = Glass: c = Clear, b = brown
K = Kerr glass canning jar Frag
A = Aluminum Squeeze tube

SENCO-PHENIX

42CB1998

General View Southeast of Site

View South of Tree Ladder and Tent Base

CHAPTER 5

ENGINEERING

LIST OF PLATES

Plate

5-1 Previously Mined Areas

5-2 Surface Facilities

5-3 Surface Facilities Cross Sections

5-4 Existing Surface Topography

5-5 Reclamation Surface Topography

5-6 Reclamation Cross Sections

5-7 Proposed Mine Sequence and Planned Subsidence Boundary

The following plates are located in Appendix 5-10

PC 5-2 Pace Canyon Fan Surface Facilities and Cross-Sections
PC 5-4 Pace Canyon Fan Existing Surface Topography
PC 5-5 Pace Canyon Fan Reclamation Topography and Cross-Sections

LIST OF APPENDICES

Appendix

5-1 **DELETED IN MAY 1999 REVISION**

5-2 Approvals for Waste-Rock Disposal

5-3 Carbon County Waste Disposal Agreement

5-3A Dugout Canyon Mine Wastewater Disposal Approval

5-4 Slope Stability Analyses

5-5 Cut and Fill Calculations

5-6 Reclamation Bond Estimate

5-7 Waste-Rock Analyses

LIST OF APPENDICES (Continued)

Appendix

5-8 Dugout Canyon Mine Blasting Plan

5-9 Sewer Pipeline Blasting Plan

5-10 Pace Canyon Fan Facilities

CHAPTER 5
ENGINEERING

510 INTRODUCTION

This chapter provides a discussion of general engineering aspects, an operation plan, a reclamation plan, design criteria, and performance standards related to the Dugout Canyon Mine. The proposed coal mining and reclamation activities associated with the mine have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

511 General Requirements

This permit application includes descriptions of the proposed coal mining and reclamation operations together with the appropriate maps, plans, and cross sections. Potential environmental impacts as well as methods and calculations utilized to achieve compliance with the design criteria are also presented.

512 Certification

Where required by the regulations, cross sections and maps in this permit application have been prepared by or under the direction of, and certified by, qualified registered professional engineers or land surveyors. As appropriate, these persons were assisted by experts in the fields of hydrology, geology, biology, etc.

512.100 Cross Sections and Maps

Previously Mined Areas. A certified map showing the location of previously mined areas within the permit and adjacent areas is provided as Plate 5-1. Plate PC5-4 in Appendix 5-10 shows the portal location for an abandoned mine in the vicinity of the Pace Canyon Fan Portal Site.

Surface Facilities. Underground development waste which is generated at the Dugout Canyon Mine will be disposed of either:

- Underground within the Dugout Canyon Mine (without bringing this waste to the surface), at the approved waste-rock disposal facility at the Dugout Canyon Mine;

- At the approved waste-rock disposal facility at the SUFCo Mine (a sister operation of SCM); or

- At the approved waste-rock disposal facility at the Skyline Mine (also a sister operation of SCM).

Copies of the Division correspondence approving the SUFCo and Skyline waste-rock disposal facilities for receipt of Dugout Canyon waste rock are provided in Appendix 5-2.

Certified maps and cross sections concerning the disposal of underground development waste at the SUFCo and Skyline Mines are provided in the respective Mining and Reclamation Plans (M&RPs) for those mines. A certified map showing the proposed location of coal storage and loading areas, and explosive storage and handling facilities, is provided as Plate 5-2. Cross sections of the proposed facilities area are provided on Plate 5-3.

A map of the existing topography prior to disturbance by SCM is provided as Plate 5-4. Also noted on Plate 5-4 is the area of disturbance which was mapped to exist at the site in 1980. Since mining ceased at the site in 1964 (as noted in section 521.100 of this M&RP), this boundary represents the area of pre-SMCRA disturbance. Plate 5-4 also shows areas of non-mining disturbance which occurred after 1980 but prior to 1996. These disturbances were created by logging activities in the area and are not subject to the requirements of R645-301 through R645-302. No areas shown on Plate 5-4 are subject to the requirements of R645-200 through R645-203. The pre-mining topography for the Pace Canyon Fan Portal Site can be seen on Plate PC5-4 in Appendix 5-10.

A certified map showing the location of the topsoil stockpile is provided as Plate 2-3. The location of the proposed topsoil stockpile for the Pace Canyon Fan Portal Site is shown on Plate PC5-2 in Appendix 5-10. The proposed location of a sediment trap is also shown on this plate.

The proposed location of the sedimentation pond is noted on Plate 5-2. No water treatment facilities will exist at the site other than the sedimentation pond.

The following facilities or activities will not exist or occur within the permit area:

- Coal preparation plant,
- Coal cleaning,
- Coal processing waste banks, dams, or embankments,
- Disposal of non-coal (non-waste rock) waste other than durable rock-type construction materials such as cinder block, and
- Air pollution control facilities.

Hence, certified maps or cross sections of these facilities are not provided in this plan. The durable rock-type construction materials will be disposed of in locations designated to receive underground development waste.

Surface Configurations. Certified maps and cross sections showing the proposed final (post-reclamation) surface configuration of the Dugout Canyon disturbed area are provided on Plates 5-5 and 5-6, respectively. Certified maps and cross sections showing the proposed final (post-reclamation) surface for the Pace Canyon Fan Portal Site is shown on Plate PC5-5 in Appendix 5-10.

Hydrology. Certified maps and cross sections associated with the hydrology of the Dugout Canyon Mine area are provided in Chapter 7.

Geology. Certified maps and cross sections associated with the geology of the Dugout Canyon Mine area are provided in Chapter 6.

512.200 Plans and Engineering Designs

All plans and engineering designs presented in this M&RP were prepared by or under the direction of and certified by a qualified registered professional engineer.

Excess Spoil. No excess spoil will be generated from the permit area.

Durable Rock Fills. No durable rock fills will exist in the permit area.

Coal Mine Waste. The designs of the waste-rock facilities at the Dugout, SUFCo and Skyline Mines were certified by a qualified registered professional engineer. Information regarding these disposal facilities can be found in their respective M&RPs.

Impoundments. An ~~The only~~ impoundment ~~to be~~ was constructed for the mining and reclamation operation in Dugout Canyon and ~~will~~ consists of ~~the~~ a sedimentation pond (see Plate 7-5). A sediment trap has been proposed for the Pace Canyon Fan Portal Site (see Plate PC7-5 in Appendix 7-12). These~~is~~ impoundments have~~s~~ been designed under the

Previously Mined Areas. Plate 5-1 shows the location and extent of known workings of active, inactive, or abandoned underground workings, including openings to the surface, within the permit and adjacent areas. No previously surface-mined areas exist within the permit area. Plate PC5-4 in Appendix 5-10 shows the portal location for an abandoned mine in the vicinity of the Pace Canyon Fan Portal Site.

Mining in the Dugout Canyon area is believed to have had its earliest beginnings in 1925 when D.J. Collins prospected for and initially hand-developed the Red Glow Mine in the Gilson seam on the east side of the canyon. Collins reportedly sold his interest in the reserve to Vaughn O'Niel in 1947, who conducted mining in the same mine on a limited scale for several years thereafter.

The first mining on the west side Dugout Canyon (i.e., the side to be occupied by the proposed portals) reportedly occurred in March 1952 when the E.S.O. Coal Company initiated development of the Rock Canyon seam mine. W.W. Clyde, a well-established Utah road construction contractor, reportedly secured the reserves in Dugout Canyon during the 1950s in order to continue coal mining operations when production ceased in another mine in the region.

Knight-Ideal reportedly initiated mining activity in Dugout Canyon in 1958. Knight-Ideal further developed the original Red Glow mine, developed a mine in the Gilson seam on the west side of the canyon, and also developed a mine in the Rock Canyon seam on the east side of the canyon which was basically superimposed above the Gilson seam mine. For the most part, Knight-Ideal developed the mines simultaneously. Historical reports indicate that, while mining in Dugout Canyon with a total of 16 employees, Knight-Ideal produced approximately 1000 tons of coal per day. Due to a decline in coal prices and W. W. Clyde's inability to successfully negotiate mining rights in a lease owned by another entity north of the existing mines, Knight-Ideal ceased operations in 1964.

Kennecott Copper and Island Creek Coal Company acquired the leases in the area during the late 1960s but did not activate the reserve. The reserve was again sold to Eureka Energy (a

Mining Sequence and Planned Subsidence. The mine plan for the Dugout Canyon Mine is presented on Plate 5-7. This map shows the boundaries of all areas proposed to be affected over the estimated total life of the coal mining and reclamation operations, including the size, sequence, and timing of mining of subareas to be affected beyond the present permit term. No surface disturbances are currently anticipated within the permit area beyond that presented in this M&RP (i.e., within the disturbed-area boundary noted on Plates 5-2 and 7-5). Planned-subsidence mining methods will be used in all of the underground mine workings shown on Plate 5-7. Detailed mine progress maps will be submitted to the Division within the annual report.

Plans for mining in areas (leased or unleased) outside of the permit area are dependant upon economic feasibility and obtaining corresponding permits. New areas will be reviewed on a case by case basis.

Land Surface Configuration. Surface contours of undisturbed areas adjacent to proposed disturbed areas associated with the mine are shown on Plate 5-2 for Dugout Canyon and Plate PC5-4 in Appendix 5-10 for the Pace Canyon Fan Portal Site. As stated in Section 521.100 of this M&RP, surface facilities have been in existence in the Dugout Canyon area since the mid-1920s. A similar mining history is assumed in Pace Canyon, refer to Chapter 4, Section 411.100 for additional information. As a result, pre-mining topographic maps do not exist. However, the surface contours in undisturbed areas shown on Plate 5-2 and Plate PC5-4 in Appendix 5-10 are considered generally indicative of original land slopes in the vicinity of the mine.

A map showing topographic conditions prior to disturbance by SCM is provided as Plate 5-4. This map also shows the area of pre-SMCRA disturbance, as mapped in 1980, together with non-mining areas of disturbance which occurred after 1980 but prior to 1996. Plate 5-4 also shows topographic conditions in undisturbed areas extending at least 100 feet from the disturbed area. Plate PC5-4 in Appendix 5-10 shows the condition of the Pace Canyon Fan Portal Site in August 2004.

Surface Facilities. Plate 5-2 shows the locations of the following surface facilities:

- Buildings, utility corridors, and facilities to be used, including:
  Water Tanks - two metal tanks on concrete pads,
  Water Well Pump House - metal building on concrete pad (Appendix 7-9),
  Fueling Station - metal structure and fueling equipment on concrete pad,
  Portals - see Section 529
  Transfer Building - see subsequent portions of this Section,
  Conveyor - see subsequent portions of this Section,
  Truck Loading Bin - metal structure on concrete pad (see Section 528),
  Fan - metal structure containing a fan,
  Substation - metal structure sitting on gravel and concrete pad,
  Small Substation - metal structure sitting on gravel and concrete pad,
  Temporary Waste Rock Storage Area - see Sections 514.200, and 536,
  Roads - see Sections 527.100 and 527.200,
  Sedimentation Pond - see Chapter 7 and Appendix 7-8,
  Office/Bath House/Shop - block and metal building on concrete pad
  Parking Areas - gravel or asphalt pads
  Storage Areas - gravel, asphalt, or soil pads
  Crusher - metal structure on concrete pad/footings
  Coal Sampler - Metal structure on skids, on concrete pad
  Storage Building - Metal structure on concrete pad
  Stoker Coal Storage Bin - concrete container

- The area of disturbance at the mine mouth,

- Coal storage and loading facilities, and

- The explosive storage and handling facility, which includes two metal magazines.

Once the office/bath house/warehouse/shop building was completed in late fall of 2002, the temporary facilities were either removed or relocated. Plate 5-2 reflects where the containers used for the temporary warehouse, storage and foreman facilities were moved following the completion of the new building. These containers were placed on either soil or a gravel pad.

Drainage facilities are shown on Plate 7-5, including the site sedimentation pond, culverts, and ditches.

Cross sections of the proposed surface facilities are provided on Plate 5-3 and Figure 7-9-2 (Appendix 7-9). The disturbed area shown on Plate 5-2 is the same as the land area for which a performance bond or other guarantee has been posted.

Under the currently approved construction plan, several areas within the existing disturbed area boundary will not be significantly disturbed during site construction. The first such area consists of 0.08 acres located on the hillside west of the portal pad, north of the substation access road, and east of the storage area adjacent to that road. The second such area consists of 0.13 acres located on the hillside above the mine haulage/manway portal. Each of the above areas is located on a hillside above the area of actual disturbance.

Plate PC5-2 in Appendix 5-10 shows the layout of the Pace Canyon Fan Portal Site. Cross sections of this facility are also shown on this map. Facilities at the Pace Canyon Fan Portal Site will include:

- Portals - see Section 529,
  Fan Shaft - 18 foot diameter shaft,
  Fan - metal structure containing a fan,
  Transformers - metal structure sitting within a concrete containment structure,
  Emergency Generators - two trailer mounted generators sitting within a concrete containment structure,
  Fuel Storage Tank - Tank sitting within a concrete containment structure adjacent to the generators,
  Sediment Trap - see Appendix 7-12.

Transportation Facilities. Roads that will be constructed, used, or maintained by SCM in the permit area for the mining and reclamation operations are shown on Plate 5-2. No rail systems or overland conveyor systems (other than the material-handling conveyors in the mine yard) will be associated with the permit area. Drainage structures associated with the roads are discussed in Section 752.200 of this M&RP. Typical cross sections of the primary roads are provided on Figure 5-1. Refer to Sections 527.100 and 527.200 for additional information concerning roads to be used

during the mining operation. As shown on Plate PC5-2 the existing road in Pace Canyon will be realigned to allow construction of the facility. However, after construction is complete the realigned road will be treated the same as the rest of the road.

Three material handling conveyors will be constructed on the surface at the mine site. As noted on Plate 5-2, the mine conveyor will transport coal from the mine to the coal stock pile. The reclaim belt will convey coal from the stock pile (via a reclaim tunnel) to the crushing facility. The loadout belt will convey coal from the crusher to the truck loading bin, from which the coal will be loaded into trucks for off-site transport. Each conveyor will be of sufficient size to handle the production levels coming from the mine and the anticipated truck loading rates. Conveyor widths will range from 42 to 60 inches.

Other Relevant Information. Information regarding the BLM surface lease in NW¼ SW¼ Sec. 23, T. 13 S., R. 12 E. is provided in Appendix 1-3. A legal description of the permit boundaries is provided in Section 114 of this M&RP.

521.200 Signs and Markers

Mine and Permit Identification Signs. A mine and permit identification sign will be displayed at the point where the county road ends and the private road enters the surface-facilities area, and at all other possible entrances to the mine site. This sign will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until after the release of all bonds for the permit area. The sign will contain the following information:

- Mine name,
- Company name,
- Company address and telephone number,
- MSHA identification number, and
- Permanent program permit identification number as obtained from the Division.

Longwall Mining. Longwall mining will be used for extraction of large, uniform blocks of coal where the panels are more than 2,500 feet in length and where a suitable longwall panel can be laid out. Coal thicknesses of up to 14 feet will be mined in the Dugout Canyon Mine using longwall methods. In areas where coal is thicker than the height capacity of the mining equipment, the unmined coal will be left on the bottom of the bed unless economic or safety conditions warrant otherwise.

The longwall mining system at the Dugout Canyon Mine will consist of three basic integrated sub-systems: self advancing roof support, shearer, and conveyance. Shield-type roof supports will be used. Shield supports are generally considered more suitable for mining conditions such as those encountered at the Dugout Canyon Mine and are designed for expansion, contraction, advancement, and movement in varying thicknesses of coal.

The longwall shearer will utilize a double-ended shearer system for efficiency and flexibility of operation. Such a system consists of two rotary cutting drums mounted on ranging arms which are pivoted to a common body containing the power and drive assemblies. An optimum-tip drive speed is associated with each drum-pick configuration and diameter to assure minimization of fines in the sheared coal. The conveyance system to be used in the mine has been designed to convey extracted coal along the 540 to 1000 foot faces.

Anticipated Production. Anticipated annual production of coal from the Dugout Canyon Mine during the permit term is a follows:

1998 - 0.1 million tons
1999 - 0.7 million tons
2000 - 2.2 million tons
2001 - 3.7 million tons
2002 - 3.9 million tons
2005 - 2009 Anticipated annual average 4,460,000 tons

Major Equipment. Major equipment to be used at the Dugout Canyon Mine is listed in Table 5-1. The same type of equipment or equivalent is expected to be used in the future.

524 Blasting and Explosives

Mining and reclamation activities at the Dugout Canyon Mine and Pace Canyon Fan facilities may require the use of blasting or explosives on the surface during construction of the surface facilities. SCM will comply with all local, State, and Federal laws in the use of explosives during construction of the site and at any other times when blasting is required at the Dugout Canyon Mine. Prior to any surface blasting, SCM will obtain approval of the blasting plan from the Division. A copy of a blasting plan using five pounds or less of explosives is included as Appendix 5-8. A copy of a blasting plan using more than five pounds of explosives is included as Appendix 5-9. A certified blaster will direct all blasting operations with the help of at least one other person. SCM will ensure that all appropriate contractors working on any project at the site are made aware of proper blasting procedures. All blasting records will be kept on file at the mine for the required period of time.

All explosives containers used at the mine will be constructed to meet or exceed the requirements of the Mine Safety and Health Administration. The surface storage containers (one for caps and one for powder) will be placed in a location that will ensure the protection of the environment and personnel (see Plate 5-2). The containers, which will rest on skids, will be constructed of ¼- to ½-inch steel plate with a lining of ½-inch plywood. Each storage container will be secured with a five-tumbler padlock and will contain two vents measuring approximately 3 inches by 3 inches.

A small metal utility trailer will be used for transportation of explosives underground. This trailer will be lined with plywood, with separate compartments for caps and powder. No metal parts will be exposed to the caps or powder. All underground blasting activities at the mine will be conducted under the direction of a MSHA certified blaster.

525 Subsidence

525.100 Subsidence Control Plan

Structures and Renewable Resource Lands. As noted in Section 521.100, no major electric transmission lines, pipeline, or agricultural drainage tile fields exist within the area of potential subsidence. As described in Section 527.100, the roads within the area of potential subsidence consist of private roads that are owned and maintained by the parent company of SCM and private citizens, including the Thayn family. These are unimproved dirt roads that may be used for access to the lease area. Localized damage that occurs to roads not owned by the parent company of SCM will be repaired to a condition acceptable to both the private landowner and SCM. No other structures are known to exist within the area of potential subsidence.

Renewable resource lands within the permit and adjacent areas are shown on Plate 4-1 and discussed in Section 411 of this M&RP. The area of potential subsidence is currently used for

livestock grazing and wildlife habitat, with limited timber production on adjacent lands to the east of Dugout Canyon (see Section 411.120). Hydrologic resources in the area are discussed in Chapter 7 of this M&RP. Information regarding baseline groundwater conditions is provided in Section 724.100.

Mining Methods. As noted in Section 523, continuous miner and longwall mining methods will be used in the Dugout Canyon Mine. The size, sequence, and timing for the development of the underground workings are shown on Plate 5-7 and in Annual Reports.

Physical Conditions Affecting Subsidence. A detailed description of the physical conditions in the permit area that may influence subsidence (i.e., overburden lithology and thickness, coal

- Minimizes additional contributions of suspended solids to stream flow or runoff outside the permit area.

All support facilities will be removed following mining in accordance with the reclamation plan discussed in Section 540 of this M&RP.

Water Pollution Control Facilities. Water pollution control facilities at the Dugout Canyon Mine consist of the sedimentation pond, the appurtenant structures associated with the sedimentation pond, and a sewage/wastewater holding tank. All water pollution control facilities will be removed following mining in accordance with the reclamation plan discussed in Section 540 of this M&RP.

The sedimentation pond and appurtenant structures will be constructed as discussed in Chapter 7 and will be used and maintained as discussed in Section 533.700. Sanitary sewage will be routed by gravity through a pipeline from the mine surface facility to a below-grade collection tank which will be located adjacent to the office/bath house building. Wastewater which collects in the holding tank(s) will be periodically hauled from the site and disposed of in the sewage lagoon at the Soldier Canyon Mine or the Price River Water Improvement District facility at Wellington, Utah. Approval for the use of these facilities by the Dugout Canyon Mine is provided in Appendix 5-3A

Water pollution control at the Pace Canyon Fan Portal Site will consist of alternate sediment control measures, a sediment trap, and secondary containment for all tanks, transformers, motors and generators. Details regarding the alternate sediment control measures and sediment trap can be found in Appendix 7-12.

527 Transportation Facilities

527.100 Road Classification

Primary roads within the disturbed area include the primary haul road, the coal storage pad road, the substation access road, the portal pad access road, and the water tank access road. The survey monument access road is classified as an ancillary road. The locations of these

roads are shown on Plate 5-2. Typical cross sections representing these roads are shown in Figure 5-1.

The private dirt roads outside of the disturbed area but within the permit area will not be classified. These unimproved dirt roads are owned and maintained by the surface land owners, including Canyon Fuel Company, LLC and the Thayn family. They may be used by SCM for access to the lease area surfaces for the collection of monitoring data (environmental and subsidence data) as well as other uses deemed appropriate by the landowner. Travel on roads over land not owned by Canyon Fuel Company, LLC will occur with landowner permission.

527.200 Description of Transportation Facilities

No surface conveyors (other than those in the mine yard immediately adjacent to the portals) or rail systems will be constructed, used, or maintained within the permit area. A description of the conveyor systems that will be used in the mine yard is provided in Section 521.100 of this M&RP.

Road Specifications. Cross sections of roads that will be used or maintained by SCM are provided in Figure 5-1. Information regarding road drainage structures is presented in Chapter 7.

The road which will access the mine is a county road that extends from the Soldier Creek Road (Utah Highway 53) to the mine (a distance of approximately 7.5 miles). Carbon County has upgraded this road to handle the increased traffic which is anticipated as a result of mine operation. The County constructed the upgrade and charges SCM a toll for use of the road.

General specifications for the site roads are provided in Table 5-3. As indicated in Figure 5-1 and Table 5-3, the primary haul road and the coal storage pad, substation access, and portal pad access roads will consist of 2 to 4 inches of granular material, asphalt, or concrete on a compacted, in-place subgrade. The surface of the roads will generally slope at angles of 1 to 2 percent for drainage. The grade of the disturbed-area primary roads will vary, but should not exceed 10% generally or 14% locally. Specifically, the primary haul road (see Plate 5-2)

will be constructed at a grade of approximately 7%, the coal storage pad road will generally be constructed at a grade of 14%, the substation access road will be constructed with an approximate grade of 13%, the portal pad access road will be constructed at a grade of about 13%, and the water tank access road will exist in its current location with an approximate grade of 10 to 14%. The primary water tank access road and the ancillary survey-monument access road will be graded and maintained as a dirt road.

Drainageway Alterations. Alterations of Dugout Creek are planned to accommodate the needs of transportation systems. These alterations consist of installation of culverts in two locations - one on the eastern tributary of Dugout Creek and one along Dugout Creek, beginning approximately 150 feet upstream from the confluence with the eastern tributary and extending downstream to near the sedimentation pond (culverts UC-4 and UC-5, respectively, as noted on Plate 7-5). Pace Creek will not be impacted by the Pace Canyon Fan Portal Site.

Culverts UC-4 and UC-5 provide several advantages, including: allowing coal haulage trucks to enter and leave the surface facilities area, protecting Dugout Creek from coal fines and sediment which may be generated on the adjacent disturbed areas, providing space for equipment and material storage, providing a location for snow to be stacked away from the operations area during winter months, providing additional parking space, and increasing the safety of vehicular traffic by eliminating the drop off into the channel area. These advantages are discussed in further detail below.

Coal haulage trucks will enter and leave the surface facilities area in the loop shown on Plate 5-2 immediately upstream from the sedimentation pond. Culverting of the stream allows a sufficient turning angle for the coal trucks to access and safely maneuver in this area.

The surface facilities at the Dugout Canyon Mine have been designed to adequately control sediment which is generated from those facilities. However, as indicated in Section 521.100 and Plate 5-4 of this M&RP, past mining at the site has resulted in previous disturbance of the surface area. As a result, several areas along the banks of Dugout Creek which may otherwise had not been disturbed by SCM (if the Dugout Creek culvert was not installed)

underground workings of the Dugout Canyon Mine is provided in Section 536.500 of this M&RP.

Material generated during construction of the shaft and portal at the Pace Canyon Fan Portal Site will be used to construct the site. This material will be used to backfill the portal and shaft during reclamation.

Minimization of Acid, Toxic, and Fire Hazards. Data presented in Chapter 6 indicate that neither acid- nor toxic-forming materials are present in the overburden, underburden, or coal. These conclusions are supported by the data contained in Appendix 5-7 and RA Attachment 5-4 (Refuse Pile Amendment), which provides the results of analyses of waste-rock materials. Should an acid- or toxic-forming problem with the waste rock be identified during future sample collection, those materials so identified will be buried within 30 days after the material is exposed at the mine site.

As noted previously in this section, temporary storage of debris generated at the mine will be in a dumpster. As a result, this debris will be protected from the wind and other elements. Because debris that is generated at the mine site will be only temporarily stored at the mine prior to off-site disposal, there is no significant potential for this debris to spontaneously combust. Fire extinguishers will be kept on mobile equipment in the mine yard to extinguish any fires should combustion of the waste materials occur. No waste materials that constitute a fire hazard will be accumulated in the permit area. No hazardous materials, as defined in 40 CFR, will be disposed of underground. These materials will be disposed of in accordance with all applicable state and federal regulations.

528.400 Dams, Embankments, and Impoundments

No dams, embankments, or impoundments will be used for the handling or disposal of coal, overburden, excess spoil, or coal mine waste in the permit area.

529 Management of Mine Openings

It is currently anticipated that five underground mine openings will be associated with the Rock Canyon and Gilson Seams. A portal and shaft will be constructed into the Gilson seam at the Pace Canyon Fan Portal Site (see Plate PC5-2 in Appendix 5-10). The primary purpose of the shaft and portal will be for ventilation. The portal will also be used as an emergency escape way. Additional openings into the Gilson Seam may be planned in the future but are not part of this M&RP.

Locations of the Rock Canyon portals are shown on Plate 5-2. One of these openings will serve as primary pathway for ingress and egress of personnel and machinery, one will serve as a beltway for removal of coal from the mine, and one will be used for mine ventilation. The remaining two portals are existing openings into the old workings and will be reopened as air-intake portals.

Each underground mine opening will be protected from deterioration through the installation of steel sets and timbers. Concrete and liner plate steel may also be used.

Any portals which become temporarily inactive in the permit area, but have a further projected useful service, will be protected through the installation of a lockable chain-link gate to prevent unauthorized entry. Warning signs will be posted to identify the hazardous nature of the opening. These protection and warning devices will be periodically inspected and maintained in good operating condition during the period of temporary inactivity.

530 OPERATIONAL DESIGN CRITERIA AND PLANS

531 General

This application contains a general plan for the sedimentation pond and sediment traps to be installed within the permit area. No other water impoundments or coal processing waste banks, dams, or embankments will exist in the permit area.

No mineable coal exists beneath the proposed sedimentation pond or sediment traps. Thus, subsidence will not affect operation of the pond or traps.

532 Sediment Control

Sediment-control measures for the Dugout Canyon Mine are described in detail in Section 732 of this M&RP. The sedimentation pond will be located at the downstream end of the mine yard. Runoff-control structures at the mine yard have been designed to convey runoff in a non-erosive manner. The sediment trap located at the Pace Canyon Fan Portal Site is discussed in Appendix 7-12.

In addition to the use of sedimentation ponds and properly designed runoff-control facilities, sediment yields in the permit area are minimized by:

- Disturbing the smallest practicable area during the construction or modification of surface facilities and
- Contemporaneously reclaiming areas suitable for such reclamation.

533 Impoundments

533.100 Slope Stability

The only impoundment with an embankment that will be constructed, used, or maintained by SCM will be the sedimentation pond at the mine surface. A slope-stability analysis which was performed on this pond embankment is provided in Appendix 5-4. According to this analysis, the minimum safety factors for the sedimentation pond embankment 1.6 under static saturated conditions. Furthermore, the analysis presented in Appendix 5-4 indicates that a minimum safety factor of 2.0 will exist for the upstream embankment under conditions of rapid drawdown. All analyses were performed assuming that the pond was full to its maximum design depth. These safety factors exceed the minimum requirements of R645-301-533.100. Refer to the Refuse Pile amendment for a discussion of it's associated pond.

533.200 Foundation Considerations

Soils investigations have been conducted at the site of the proposed Dugout Canyon surface facilities. Results of these investigations are presented in Chapter 2 and Appendix 5-4 of this M&RP. During these investigations, foundation conditions in the area of the proposed sedimentation pond were evaluated. Based on these investigations, no conditions were encountered which suggested that the foundations upon which the pond would be constructed would be unstable. The slope-stability analyses presented in Appendix 5-4 indicate that the pond foundations will also be stable under operating conditions.

Prior to construction of the sedimentation pond, all vegetative matter and topsoil will be removed from the foundation area. Detailed cross sections of the sedimentation pond are presented on Plate 7-4 of this M&RP.

533.300 Slope Protection

The outslopes and inslopes of the sedimentation pond and sediment trap in Pace Canyon will be revegetated following construction to minimize surface erosion and protect the embankments against sudden drawdown. The seed mix to be used for this revegetation effort is described in Section 341.200 of this M&RP.

In the event of a storm, rapid drawdown in the sedimentation pond would be restricted to the vertical distance between the spillway and the peak water level, a distance of 0.20 foot (Plate 7-4). Drawdown of this magnitude is not considered significant and, therefore, not of erosional concern. The analysis presented in Appendix 5-4 indicates that the upstream slope of the embankment will be stable under conditions of rapid drawdown (minimum safety factor of 2.0).

During normal decant of the sedimentation pond, flow rates (and drawdown) will be controlled. Hence, it is unlikely that this drawdown will cause surface erosion of the embankment face.

533.400 Embankment Faces

Embankment inslopes and outslopes will be revegetated following construction of the sedimentation pond and Pace Canyon sediment trap, as outlined in Section 533.300. Riprap will also be placed on the upstream face of the embankment near the discharge structure.

533.500 Highwalls

No highwalls will be located below the water lines of the sedimentation pond.

542 Narratives, Maps, and Plans

542.100 Reclamation Timetable

A timetable for the completion of each major step in the reclamation plan is presented in Figure 5-3.

542.200 Plan for Backfilling, Soil Stabilization, Compacting, and Grading

The regrading plans for the waste rock disposal facilities at the Dugout Canyon Mine (Refuse Pile Amendment, February 2003), SUFCo and Skyline Mines are presented in their respective M&RPs. The Dugout Canyon and the Pace Canyon Fan Portal Site regrading plans were~~as~~ designed to meet the objectives of balancing cut and fill quantities, maintaining a geotechnically stable base. The primary features of this plans are:

- Removal of the pad upon which surface activities will be constructed at the mine, thereby creating a slope which will adequately drain while minimizing long-term erosion concerns;
- Backfilling to remove highwalls within the objectives noted above (cut and fill balance, site stability, and erosion control),
- Construction of stable channels across regraded areas;
- Placement of topsoil;
- Revegetation and mulching of the topsoiled site; and
- Removal of the sedimentation pond and sediment trap (together with accompanying regrading, topsoiling, revegetation, and mulching of the sedimentation pond area) and implementation of interim sediment-control measures.

The estimated cut quantity for the Dugout Canyon facility is approximately 97,575 cubic yards with an estimated fill of 99,630 cubic yards (see Appendix 5-5). The difference between these

two quantities is anticipated to be balanced by compaction and the import of topsoil from the stockpile. Regrading activities will continue until the final surface configuration defined by Plates 5-5 and 5-6 is approximated. Details regarding topsoil placement and revegetation following regrading are provided in Chapters 2 and 3, respectively.

The estimated cut quantity for the Pace Canyon Fan Portal Site is approximately 5,069 cubic yards with an estimated fill of 5,262 cubic yards. These values include 1900 cubic yards of topsoil being placed on the surface and approximately 667 cubic yards of material being used to backfill the portal and shaft. The difference between these two quantities is anticipated to be balanced by swell of the cut material. Regrading activities will continue until the final surface configuration defined by Plate PC5-5 in Appendix 5-10 is approximated. Details regarding topsoil placement and revegetation following regrading are provided in Chapters 2 and 3, respectively.

Building Demolition. Prior to significant regrading activities at the Dugout Canyon facility and Pace Canyon Fan Portal Site, existing buildings, retaining walls, utilities, coal-handling facilities, and other above-ground structures will be removed from the area. To the extent possible, these structures and facilities will be salvaged. Those materials requiring off-site disposal will be placed in a permitted landfill. Final decisions regarding salvage or disposal of structures and equipment will be made just prior to reclamation following an assessment of the salvageability of the structures and equipment. If foundations will not interfere with regrading activities, they will be left in place for on-site burial under at least 4 feet of soil cover.

Backfilling and Compaction. All vegetation, organic matter, and debris will be cleared from areas to receive fill. The cut material from site regrading will be placed as fill and graded to facilitate drainage from the ~~mine~~ site and contributing side areas. All fill placed during recontouring of the site will be compacted to at least 85 percent of maximum Proctor density (ASTM D698). Compaction will be accomplished using repeated passes of rubber-tired equipment, rollers, and other appropriate equipment.

Side hill embankments, where the width is too narrow to allow access by compaction equipment, will be initially constructed by spreading the soil with a dozer, but only to a width necessary to allow compaction equipment access. After this is achieved, the fill will be placed in lifts and compacted to at least 85 percent of maximum Proctor density.

Lifts will be placed with a thickness when compacted of no more than 8 inches. Care will be taken to ensure that fill materials are not frozen during placement or compaction. Any areas that are damaged by freezing will be reconditioned, reshaped, and recompacted to at least 85 percent of maximum Proctor density. All fill placement and compaction activities will be overseen by an experienced engineer.

Previous (pre-SMCRA) mining in the area has resulted in the exposure of coal outcrops incident to mining activities. All coal outcrops within the proposed disturbed area will be covered with at least 4 feet of soil during reclamation. Asphalt materials which are removed from site surfaces will also be covered with at least 4 feet of soil during reclamation. In general, grading and backfilling operations will proceed from the upstream end of the surface facilities to the downstream end, thus allowing the sedimentation pond and sediment traps to remain effective for as long as possible.

Construction of Reclamation Channels. Reclamation channels will be constructed at the locations shown on Plate 5-5 for the Dugout Canyon facility and Plate PC7-7 in Appendix 7-12 for the Pace Canyon Fan Portal Site. These channels will be constructed to capture runoff from undisturbed areas and convey this runoff to and through Dugout Creek or Pace Creek. Details regarding the design and construction of these channels are provided in Section 760 of this M&RP.

As noted on Plate 5-5, slopes adjacent to the reclaimed Dugout Creek have typically been designed with a grade of 2H:1V. These slopes are generally shallower than the natural slopes adjacent to the creek both up- and downstream from the disturbed area (where natural slopes on the hillsides adjacent to the stream are typically 1.5H:1V or steeper). Hence,

access to the stream by wildlife and livestock under post-mining conditions should not be hindered within the reclaimed area.

Attempts to reduce the post-reclamation slopes entering the steam channel were not fruitful since reducing the slopes would result in increased cut quantities which would require off-site disposal. Furthermore, since the reclaimed slopes will generally be less than the natural slopes both up- and downstream from the disturbed area, a further reduction was not considered necessary to support post-mining wildlife and livestock usage of the area.

Sedimentation Pond Removal and Interim Sediment Control. Prior to the start of reclamation activities, temporary silt fences will be emplaced in the stream channel perpendicular to the flow direction in accordance with Figure 5-4. A minimum of four such silt fences will be installed in the creek downstream from the by-pass culvert (UC-5) outlet but within the disturbed area prior to removal of the culvert. The downstream-most silt fence will be installed in the stream at the downstream end of the disturbed-area boundary, downstream from the location of the energy dissipater. The silt fences will be located in an area convenient for maintenance and cleanout. The silt fences will be removed when reclamation construction activities are completed. During reclamation activities, the silt fences will be periodically inspected and accumulated sediment will be removed from behind the silt fences when required to minimize downstream impacts.

The sedimentation pond and sediment trap in Pace Canyon will be retained for as long as practical during reclamation. Once backfilling and grading operations proceed to the location of the pond, it will be removed. Because the pond is designed primarily as an excavated structure, removal of the pond will consist primarily of backfilling. This removal will be accomplished using backhoes, loaders, dozers, and other appropriate earthmoving equipment.

As soon as regrading of an area no longer allows that area to drain to the sedimentation pond or sediment trap, silt fences will be installed along the base of the slopes adjacent to Dugout

Creek and Pace Creek and its tributaries to control erosion on an interim basis prior to revegetation success. These silt fences will be installed using a supportive backing and burying the toe of the filter fabric as noted in Figure 5-4.

On a temporary basis, straw-bale dikes may also be installed as necessary to control localized erosion prior to the establishment of revegetation efforts. If installed, locations of the straw-bale dikes will be selected to reduce sediment contributions to runoff based on field observations. Straw-bale dikes will be installed by keying the bales into the ground as noted in Figure 5-4.

542.300 Final Surface Configuration Maps and Cross Sections

Final surface configuration maps and cross sections for the Dugout Canyon site are provided on Plates 5-5 and 5-6, respectively. The final surface configuration map and cross sections for the Pace Canyon Fan Portal Site can be found on Plate PC5-5 in Appendix 5-10. Roads which access the private lands within the permit area will remain following reclamation, including the public (County) road(s). No other facilities related to the coal mining operations will remain in the permit area following reclamation.

542.400 Removal of Temporary Structures

All surface structures associated with the mining operation will be removed as outlined in Section 542.200. A description ensuring that all structures and the sedimentation pond have been removed will be provided to the Division before seeking bond release or abandoning the permit area.

542.500 Removal of Sedimentation Pond

Information regarding removal of the sedimentation pond associated with the Dugout Canyon Mine is provided in Section 542.200. The timetable for removal of this pond is indicted in Figure 5-3.

542.600 Roads

All roads not to be retained for an approved post-mining land use will be reclaimed immediately after they are no longer needed for mining and reclamation operations. Roads which will be retained through the disturbed area for access to private land within the permit area are noted on Plate 5-5 and on Plate PC5-5 in Appendix 5-10. All remaining roads within the disturbed area will be reclaimed.

In all cases (whether the road is to be retained for a post-mining land use or not), all asphalt or concrete surfaces will be removed from the roads during reclamation. The retained roads will then be regraded to drain to the downslope side of the road. The road surface materials will be buried on site beneath at least 4 feet of non-acid and non-toxic forming materials. All roads to be reclaimed will be graded and/or backfilled as indicated above. Topsoil will be applied to the regraded surfaces and the area will be revegetated as discussed in Chapters 2 and 3, respectively.

553.100 Disturbed Area Backfilling and Grading

Approximate Original Contour. As indicated in Section 521.100 of this M&RP, the area of the proposed Dugout Canyon surface facilities was disturbed by previous mining activities. No pre-mining topographic maps of the area are known to exist. The reclamation plan has been designed to allow that the site will be backfilled and graded to achieve the assumed approximate original contour (i.e., to blend into the surrounding topography) and eliminate existing highwalls.

As with the Dugout Canyon site the Pace Canyon site had been previously disturbed by mining activities and road construction. Maps showing this area prior to disturbance do not exist. The reclamation plan has been prepared to achieve the assumed approximate original contour and eliminate any highwalls and cutslopes.

Elimination of Highwalls, Spoil Piles, and Depressions. The backfilling and grading plans have~~s~~ been designed to eliminate highwalls at the sites. No spoil piles exist. With the exception of the small depressions discussed in Section 552.100, no depressions will remain at the site following reclamation.

Slope Stability. Backfilled and regraded slopes have been designed to not exceed the angle of repose (determined in Appendix 5-4 to be a slope of 1.5H:1V). At this slope, final reclamation slopes have been designed with a minimum static safety factor of 2.6 (see Appendix 5-4). The static safety factor increases with decreasing slope. Furthermore, as indicated in Appendix 5-4, the highest reclamation slope at the site (cross section R-R', as indicated on Plate 5-6) will also have a minimum safety factor of 2.6. The slopes have thus been designed to prevent slides.

In Pace Canyon reclaimed slopes will be at a 2H:1V slope or less over most of the site. However, there will be some small areas where the slope may be up to 1.6H:1V . This will

only occur in areas where the reclaimed surface ties into an undisturbed area with a slope greater than 2H:1V.

Erosion and Water Pollution. Temporary sediment-control measures will be implemented during and following backfilling and regrading as outlined in Section 542.200 and Section 244 of this M&RP. As vegetation becomes established on the reclaimed surfaces, erosion potentials will be further minimized. By minimizing erosion, water pollution will also be precluded. Additional water-quality concerns do not exist at the site (see Chapter 7).

In an effort to eliminate pre-existing highwalls at the Dugout Canyon site following reclamation, soil may be replaced during reclamation at slopes of up to 1.5H:1V. The steepness of these slopes will be reduced at their base, providing a concave slope. As noted above, these slopes will be geotechnically stable. Dozers will be used during placement of the topsoil or substitute topsoil on these steep slopes, taking care to achieve a reasonably uniform thickness of the final soil cover. Following placement and prior to seeding, all areas with a slope steepness of 3H:1V or steeper will be deep gouged using a trackhoe. The final surface will consist of mounds and depressions capable of holding runoff and difficult to walk on. Refer to Sections 355 and 341 regarding erosion-control matting and revegetation.

Although the gouging will extend below the depth of the final topsoil layer, information presented in Section 222.400 of this M&RP indicates that the subsoils will be of acceptable chemical and physical quality, with the possible exception of the percentage of rock fragments. Hence, the surface will still be capable of sustaining an adequate vegetative cover, further minimizing long-term erosion of the slopes.

Post-Mining Land Use. The disturbed area will be backfilled and regraded in a manner that supports the approved post-mining land use.

553.500 Highwalls From Previously Mined Areas

Several highwalls currently exist within the proposed disturbed area that are the result of previous mining operations. The reclamation plan has been designed to eliminate these highwalls.

553.600 Previously Mined Areas

As noted previously, the reclamation plan has been designed to eliminate pre-existing highwalls within the disturbed area following reclamation. Section 542.200 of this M&RP indicates that the plan has been designed with a reasonable balance between cut and fill quantities. Section 553.100 indicates that slopes of up to 1.5H:1V may be required to eliminate the highwalls. The steepness of these slopes will be reduced at the base to provide a concave profile. According to Appendix 5-4, these slopes will be geotechnically stable. Procedures to minimize erosion on these reclamation slopes are discussed in Section 553.100.

The anticipated post-mining contours noted on Plate 5-5 and Plate PC5-5 in Appendix 5-10 indicate that the available materials are sufficient to eliminate all existing highwalls within the disturbed-area boundary during reclamation. However, if field conditions indicate that all available materials are not sufficient to eliminate the existing highwalls without exceeding the performance criteria outlined in the preceding paragraph, small sections of highwall may be retained. Division approval will be obtained before any highwalls are retained. If it is necessary to retain any existing highwalls at the site, analyses will be performed to show that the retained highwalls are stable and compatible with the postmining land use. Specifically, this analysis will address the requirements of Sections R645-301-553.600 through R645-301-553.650 of the regulations.

APPENDIX 5-6

Reclamation Bond Estimate

Bonding Calculations

Direct Costs

Subtotal Demolition and Removal	$876,787.00	
Subtotal Backfilling and Grading	$553,543.00	
Subtotal Revegetation	$363,540.00	
Direct Costs	$1,793,870.00	
Indirect Costs		
Mob/Demob	$179,387.00	10.0%
Contingency	$89,694.00	5.0%
Engineering Redesign	$44,847.00	2.5%
Main Office Expense	$121,983.00	6.8%
Project Mainagement Fee	$44,847.00	2.5%
Subtotal Indirect Costs	$480,758.00	26.8%
Total Cost	$2,274,628.00	
Escalation factor		0.0259
Number of years		2
Escalation	$119,352.00	
Reclamation Cost Escalated	$2,393,980.00	
Bond Amount (rounded to nearest $1,000)	$2,394,000.00	
2005 Dollars		

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Facilities Area 01															308109
Facilities Area 02															119177
Stream Channel 03															32869
Gabion Basin 04															
Refuse Pile 05															71327
Fan Portal															22061
Subtotal															553543

Ref.	Description	Materials	Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Degas Well G45																			
	Soil Preparation																			
	Pocking	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY					16.8						AC		27104	CY	46890
	Subtotal																			46890
	Seed Mix No 1																			
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	18.8	/MSF					16.8						AC		732	MSF	13762
	Hydroseed Material	Dugout Seed Mix No 1	Dugout 07391S	394.75	/AC					16.8						AC		16.8	AC	6632
	Hay Mulch	Hay material only 02370 700 1200	Reveg001R	57.2	/ton					16.8						AC		16.8	ton/AC	961
	Transplant Area No 1																			
	Area																			
	Transplant Materials	Dugout Transplant Mix No 1	Dugout 07391T	349	/AC					16.8						AC		16.8	AC	5863
	Transplant Labor	Bare root seedlings, 6" to 10"	02912 350 0711	1.21	Ea										550	#/AC		9240	EA	11180
	Subtotal																			38398
	Direct Vegetation																			85288
	Reseeding																			
	Assume 25% reveg rate																			1271
	Total																			86559

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Dugout Mine Vegetation																			155471
	Dugout Mine Refuse Pile																			88116
	Degas Well G1																			6355
	Degas Well G2																			6355
	Degas Well G3																			6355
	Degas Well G45																			86559
	Pace Fan																			14329
	Total																			363540

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Methane Degas Wells 45																			
	Structure's Demolition Cost	Plug Well	AML3	5000	EA.										15	EA		15	EA	75000
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			75000
	Fence																			
	Silt Fence	Silt fence	02370 700 1100	1.01	LF	12970										FT		12970	FT	13100
	Chicken Wire Fence	Fence Chicken Wire	02820 410 0012	6.55	LF	12970										FT		12970	FT	84954
	Subtotal																			98054
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			173054

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Mine Belt BC-1 No 1																			18646
	Transfer Building No 2																			33771
	Feed Belt BC 2 No3																			13293
	Stack Tubes 2 No4																			3622
	Head House 1 No 5																			6434
	Transfer Belt BC 2 No 6																			8470
	Head House 2 No 7																			1573
	Reclaim Tunnel No 8																			33338
	Reclaim Belt BC 4 No 9																			11589
	Escape Tunnel 60 inch No 10																			919
	Crusher Building No 11																			30173
	Truck Loadout Belt BC 5 No 12																			9593
	Truck Loudout and Scale No 13																			24755
	Bathhouse No 14																			133545
	Substation No 15																			1756
	Power Lines and Poles No 16																			1958
	Retaining Wall No 17																			690
	Gabion Wall No 18																			56455
	Pump House No 19																			2653
	Paved Road No 20																			55198
	Stream Culvert 72 inch No 21																			44195
	Water Tanks No 22																			3021
	Rock Dust Bin No 23																			1058
	Fuel Tank and Fuel Station No 24																			1561
	Holding Tank No 25																			319
	Ventilation Fan No 26																			2177
	Magnet 27																			483
	Water System 28																			68778
	Sewage System 29																			23050
	Item 30 removed																			
	Storage Containers 31																			9480
	Gilson Well No 32																			1489
	Shop Building No 33																			4889
	Switch House No 34																			1007
	Portals No 35																			26000
	Storage Building No 36																			1749
	Sampling System No 37																			1301
	Degas Well G1 No 38																			7136
	Degas Well G2 No 39																			18071
	Degas Well G3 No 40																			12476
	Stoker Storage Bin No 41																			809
	Substation No 2 No 42																			2595
	Gabion Baskets No 43																			960
	Refuse Site No 44																			9230
	Methane Degas Wells 45																			173054
	Pace Fan																			13468
	Total																			876787

Pace Canyon Fan Portal
Bond Calculations

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Culvert - Pace Fan																			
	Excavate Culvert	Excavation Bulk Bank 2 CY (322BL)	02315 424 0260	1.68	/CY	440	3	6								CF		293	CY	492
	Backfill Culvert	Backfill Trench Mininal Haul 2 1/4 CY	02315 610 3080	1.49	/CY	440	3	6								CF		293	CY	437
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight											6				TON		6	TON	
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck	Truck dump 16 ton payload	01590 200 5300	435.96	/day									0.4		DAY		0.4	DAY	174
	Transportation Cost Steel Truck Drive	Truck Driver, Heavy	Trhv	$40.30	HR									3		HR		3	HR	121
	Disposal Cost Steel																			
	Subtotal																			1224
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1224

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Generator Pad/Containment - Pace Fan																			
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.25	/CF						0					CF		0	CF	0
	Structure's Vol. Demolished																0.35	0	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight											0				TON		0	TON	
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck	Truck dump 16 ton payload	01590 200 5300	435.96	/day									0		DAY		0	DAY	0
	Transportation Cost Steel Truck Drive	Truck Driver, Heavy	Trhv	$40.30	HR									0		HR		0	HR	0
	Disposal Cost Steel																			
	Subtotal																			0
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	9.05	/CY						192					CY		192	CY	1738
	Concrete's Vol. Demolished																1.3	250	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.3	/CY													250	CY	325
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. tri	02320 200 0320	3.09	/CY													250	CY	773
	Disposal Costs	On site disposal	02220 875 5550	6.3	/CY													250	CY	1575
	Subtotal																			4411
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			4411

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Portal - Pace Fan																			
	Structure's Demolition Cost	Seal Portals	AML1	5200	EA.										1	EA		1	EA	5200
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			5200
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			5200

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Ventilation Fan - Pace																			
	Structure's Demolition Cost	Steel Bld. Large	02220 110 0012	0.25	/CF						7500					CF		7500	CF	1875
	Structure's Vol. Demolished																0.35	97	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight											16				TON		16	TON	
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck	Truck dump 16 ton payload	01590 200 5300	435.96	/day									1		DAY		1	DAY	436
	Transportation Cost Steel Truck Drive	Truck Driver, Heavy	Trhv	$40.30	HR									8		HR		8	HR	322
	Disposal Cost Steel																			
	Subtotal																			2633
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2633

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Pace Canyon Fan Portal Stream Channel Remove Culvert and Restore Channel															
CAT 330BL 2001 (10-21)(3Q03)	10530	42.6	0.1	50.7	163.37	1	163.37	$/HR	4000	CY	310	CY/HR	12.9	HR	2107
CLAB					40.5	0.5	20.25	$/HR					12.9	HR	261
966G EROPS (9-37) (3Q03)	6510	27	0.1	50.7	121.09	1	121.09	$/HR	2000	CY	204	CY/HR	9.8	HR	1187
CLAB					40.5	0.5	20.25	$/HR					9.8	HR	198
6X4 70,000lbs 12-18 CY (20-1) (2Q03)	3590	25.8	0.1	40.3	91.12	1	91.12	$/HR	0	CY	50	CY/HR	0	HR	0
CLAB					40.5	0.5	20.25	$/HR					0	HR	0
Support															
Foreman Average, Outside					55.45	1	55.45	$/HR					12.9	HR	715
5,000 gal H2O truck Diesel (20-6) (2Q03)	4855	27.95	0.1	40.3	101.39	1	101.39	$/HR					12.9	HR	1308
Pickup Truck Crew 4x4 1 ton (20-7) (2Q03)	875	4.45	0.1	0	10.36	1	10.36	$/HR					12.9	HR	134
Subtotal															5910

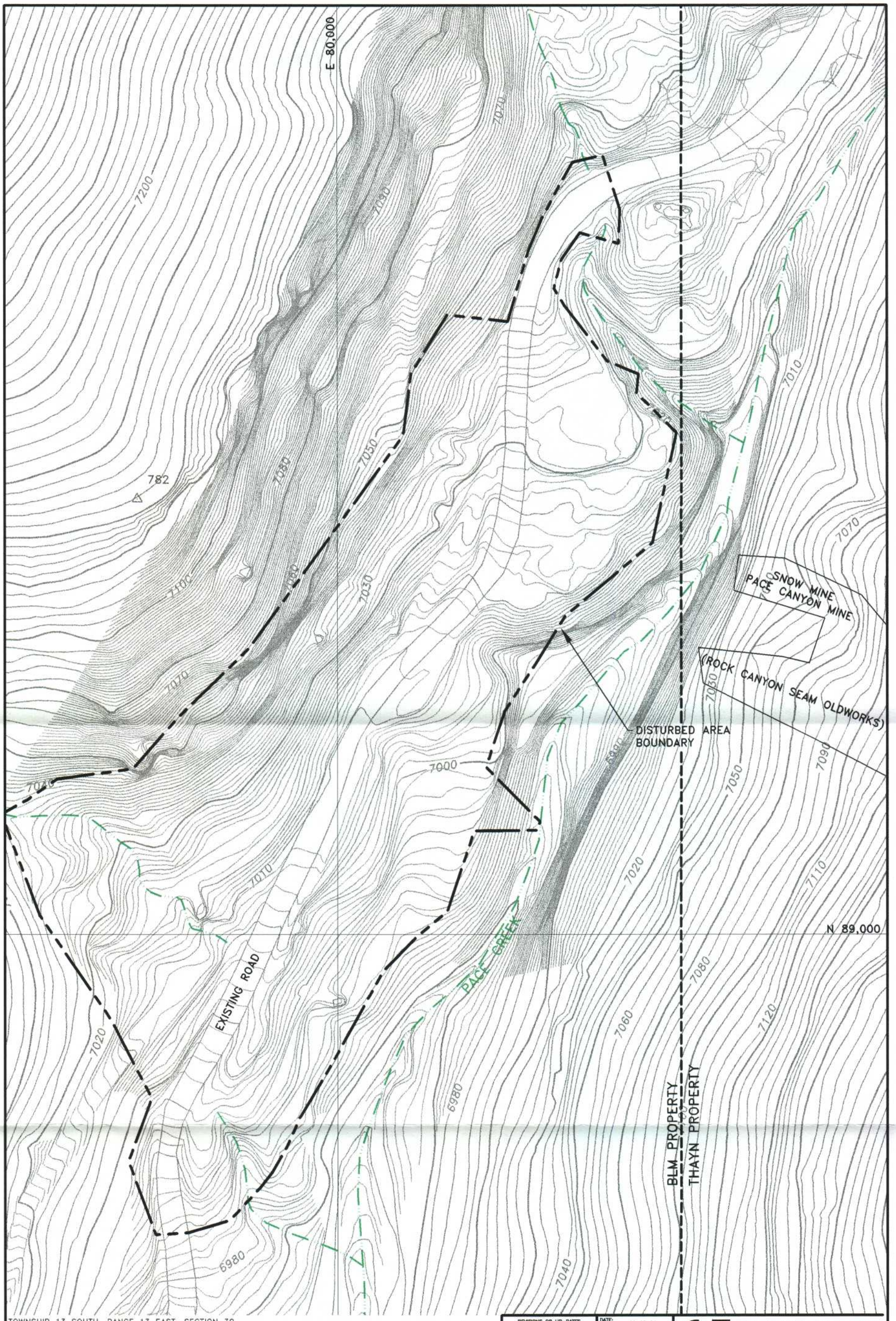
	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Pace Fan															
Facilities Area															
Cut and Fill at Mine Site															
Equipment															
Rough Grading															
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	50.7	228.61	1	228.61	$/HR	3400	CY	184	CY/HR	18.5	HR	4229
Finished Grading															
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	50.7	228.61	1	228.61	$/HR	1000	CY	680	CY/HR	1.5	HR	343
815F ((6-13) (4Q03))	9140	35.35	0.1	50.7	146.71	1	146.71	$/HR	3400	CY	876	CY/HR	3.9	HR	572
CAT 345BL 2000 (10-21)(3Q03)	13965	55.25	0.1	50.7	198.76	1	198.76	$/HR	1000	CY	308	CY/HR	3.2	HR	636
966G EROPS (9-37) (3Q03)	6510	27	0.1	50.7	121.09	1	121.09	$/HR	0	CY	204	CY/HR	0	HR	0
Support Personel and Labor															
CLAB					40.5	1	40.5	$/HR					18.5	HR	749
5,000 gal H2O truck Diesel (20-6) (2Q03)	4855	27.95	0.1	40.3	101.39	1	101.39	$/HR					18.5	HR	1876
Pickup Truck Crew 4x4 1 ton (20-7) (2Q03)	875	4.45	0.1	0	10.36	1	10.36	$/HR					18.5	HR	192
Foreman Average, Outside					55.45	1	55.45	$/HR					18.5	HR	1026
Subtotal															9623

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Dugout Mine Pace Canyon Fan Topsoil Disturbution															
Move topsoil															
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	50.7	228.61	1	228.61	$/HR	1900	CY	184	CY/HR	10.3	HR	2355
Pocking Handled in Vegetation Section															
966G EROPS (9-37) (3Q03)	6510	27	0.1	50.7	121.09	1	121.09	$/HR	1200	CY	204	CY/HR	5.9	HR	714
6X4 75,000lbs 12-18 CY (20-1) (2Q00)	3580	25.05	0.1	38.1	88.03	6	528.18	$/HR	500	CY	204	CY/HR	2.5	HR	1320
Support Personel and Labor															
CLAB					40.5	1	40.5	$/HR					10.3	HR	417
5,000 gal H2O truck Diesel (20-6) (2Q03)	4855	27.95	0.1	40.3	101.39	1	101.39	$/HR					10.3	HR	1044
Pickup Truck Crew 4x4 1 ton (20-7) (2Q03)	875	4.45	0.1	0	10.36	1	10.36	$/HR					10.3	HR	107
Foreman Average, Outside					55.45	1	55.45	$/HR					10.3	HR	571
Subtotal															6528

Ref.	Description	Materials	Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Pace Canyon Fan - Vegetation																			
	Soil Preparation																			
	Pocking	Excavation Bulk Bank 2 CY (322BL)	02315 424 0260	1.68	/CY					2.7						AC		4356	CY	7318
	Subtotal																			7318
	Fence																			
	Silt Fence	Silt fence	02370 700 1100	1.01	LF	700										FT		700	FT	707
	Chicken Wire	Fence Chicken Wire	02820 410 0012	6.55	LF											FT		0	FT	0
	Subtotal																			707
	Seed Mix No 3																			
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	18.8	/MSF					2.7						AC		118	MSF	2218
	Hydroseed Material	Dugout Seed Mix No 1	Dugout 07391S	394.75	/AC					2.7						AC		2.7	AC	1066
	Hay Mulch	Hay material only 02370 700 1200	Reveg001R	57.2	/ton					2.7						AC		2.7	ton/AC	154
	Transplant Area No 1																			
	Area																			
	Transplant Materials	Dugout Transplant Mix No 1	Dugout 07391T	349	/AC					0						AC		0	AC	0
	Transplant Labor	Bare root seedlings, 6" to 10"	02912 350 0711	1.21	Ea										0	#/AC		0	EA	0
	Seed Mix No 2																			
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	18.8	/MSF					0						AC		0	MSF	0
	Hydroseed Material	Dugout Seed Mix No 2	Dugout 07392S	711.25	/AC					0						AC		0	AC	0
	Hay Mulch	Hay material only 02370 700 1200	Reveg001R	57.2	/ton					0						AC		0	ton/AC	0
	Transplant Area No 2																			
	Area																			
	Transplant Materials	Dugout Transplant Mix No 1	Dugout 07391T	349	/AC					0						AC		0	AC	0
	Transplant Labor	Bare root seedlings, 6" to 10"	02912 350 0711	1.21	Ea										0	#/AC		0	EA	0
	Subtotal																			3438
	Direct Vegetation																			11463
	Reseeding																			
	Assume 25% reveg rate																			2866
	Total																			14329

APPENDIX 5-10

Pace Canyon Fan Facilities



TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

RECEIVED

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DIV. OF OIL, GAS & MINING

TOPOGRAPHY FROM OLYMPUS AERIAL SURVEYS INC.
FLOWN 08-12-04

REGISTERED PROFESSIONAL ENGINEER
No. 180797
LAYNE D. JENSEN
STATE OF UTAH

REVISIONS OR UP-DATES		
NO.	DATE	BY

DATE:	11-16-04
DESIGNED BY:	LDJ
DRAWN BY:	SWF
CHECKED BY:	VSM
SCALE:	1"=60'

FILENAME: G:\UC801\07\PERMIT DWG\PLATE5-4A.DWG\11-16-04

Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN EXISTING SURFACE TOPOGRAPHY

P.O BOX 1029
WELLINGTON, UTAH 84542

DRAWING OR MAP NUMBER
PLATE PC5-4

EarthFax Engineering, Inc.

CHAPTER 7
HYDROLOGY

LIST OF APPENDICES

Appendix

7-1 Water Rights Data

7-2 Groundwater Monitoring Data

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CHAPTER 7
HYDROLOGY

710 INTRODUCTION

711 General Requirements

This chapter presents a description of:

- Existing hydrologic resources within the permit and adjacent areas;
- Proposed operations and the potential impacts to the hydrologic balance;
- Methods of compliance with design criteria and the calculations utilized to show compliance;
- Applicable hydrologic performance standards; and
- Hydrologic reclamation plans for the Dugout Canyon Mine.

Additional information can be found in the following amendments: Methane Degassification Amendment (August 2003), Refuse Pile Amendment (February 2003), and the Leachfield Addendum A-1 (March 2001). The remainder of the State Lease ML-48435-OBA (SITLA Lease) was incorporated into the Dugout Canyon Mine permit area in 2005.

712 Certification

All maps, plans, and cross sections presented in this chapter have been certified by a qualified, registered professional engineer.

713 Inspection

Impoundments associated with the mining and reclamation operations will be inspected as described in Section 514.300 of this M&RP.

The data presented in Figure 7-10 indicate that discharge from the Flagstaff Formation dominates the flow of Dugout Creek throughout the year. Seepage from the underlying formations may slightly influence the flow of Dugout Creek during the autumn months, but this influence appears to be minimal. The lack of seepage from the Blackhawk and immediately-overlying formations to Dugout Creek supports the conclusion presented in Section 724.100 that the flow of groundwater within the permit and adjacent areas is to the north-northwest (i.e., away from Dugout Canyon).

Limited flow data is available from monitoring points within Pace Canyon and Rock Canyon Creeks. However, the data included in Appendix 7-7 suggests that flow within Pace Canyon Creek varies seasonally. Data collected at points PC-1A and PC-2 since June 1999, which are included in the Division's water database and in the updated spreadsheets found in Appendix 7-7, supports this determination. Flows in spring/early summer are typically several times greater than in late summer/fall. Also, it is interesting to note that in 2002 and 2003 there have been periods when there is no flow at station PC-2 and flows measured in late summer/fall at PC-1A have been significantly less than in previous years. The drop in flow is undoubtedly related to the prolonged drought the area has been suffering through since 1999. Base flow within this drainage appears to originate from springs discharging from the Castlegate Sandstone, Price River, Flagstaff/North Horn, and Colton Formations. The majority of the flow appears to originate from springs within the North Horn and Flagstaff Formations. A surface water monitoring point (Fan) has been added on Pace Creek at a location approximately 600 feet upstream from the top of the Pace Canyon Fan facilities disturbed area boundary. Surface flows measured at monitoring point Fan indicate that the stream is intermittant and likely fluctuates in flow volume seasonally. Rock Canyon Creek base flow in its upper reaches appears to originate from springs discharging from the Northhorn Formation. Flow data from monitoring site RC-1 indicates the lower sections of Rock Creek generally flow in response to spring runoff and after summer precipitation events.

Surface flows measured at monitoring point RC-1 near the mouth of Rock Canyon indicate that the stream is intermittant and also fluctuates in flow volume seasonally. In 2002 and 2003, flow was measured at RC-1 only flowed after a significant precipitation event. Again, the lack of flow in this creek is most likely related to the drought conditions that appear to have begun in the area in 1999.

No streamflow data are available for ephemeral drainages in the permit and adjacent areas. When it does occur, ephemeral runoff in the area is expected to occur predominantly in the months of

Sediment yields may increase locally due to subsidence. Subsidence cracks which intersect stream channels with steep gradients could, for a short period of time, cause an increase in the sediment yield of the stream. However, this sediment increase would cause the crack to quickly fill, recreating pre-subsidence stream channel conditions. Thus, the potential impact to sediment yield from subsidence in the permit area would be minor and of short duration.

Various sediment-control measures will be implemented during reclamation as the vegetation becomes established. As discussed in Section 542.200 of this M&RP, these measures will include installation of silt fences and straw-bale dikes in appropriate locations to minimize potential contributions of sediment to Dugout Creek and Pace Creek. These measures will reduce the amount of erosion from the reclaimed areas, thereby precluding adverse impacts to the environment.

Acidity, Total Suspended Solids, and Total Dissolved Solids. Probable impacts of mining and reclamation operations on the acidity and total suspended solids concentrations of surface and groundwater in the permit and adjacent areas were addressed previously in this section.

Data presented in Appendix 7-2 and summarized in Section 724.100 of this M&RP indicate that the average TDS concentration of water in the Blackhawk Formation (as measured in inflow to the nearby Soldier Canyon Mine) is approximately 750 mg/l and is of the sodium-bicarbonate type. As noted in Section 724.200, the TDS concentration of water in Dugout Creek ranges from 350 to 500 mg/l. The TDS concentration in Pace Creek ranges between 525 and 840 mg/l with an average TDS of about 620 mg/l. The dominant ions in these~~is~~ waters are calcium, magnesium and bicarbonate during high-flow periods, whereas the dominant ions during low-flow periods are sodium, magnesium, sulfate, and bicarbonate.

These data suggest that the TDS concentration of water in Dugout Creek and Pace Creek can be expected to increase if water is discharged from the mine to the Creek. During periods of low streamflow, the dominant ions in the Blackhawk Formation water, Pace Creek and Dugout Creek should be similar. However, during periods of high streamflow, the dominant cation will be sodium in the Blackhawk water, magnesium in the Pace Creek water, and calcium in Dugout Creek. It should be noted that it is anticipated that the Dugout Canyon Mine will use powdered limestone or dolomite (i.e., calcium-magnesium-carbonate) for rock dust. It is not anticipated that gypsum rock dust (calcium-sulfate) will be used in the mine. Hence, dissolution of rock dust by water in the mine

should not influence the chemical type of water in Dugout Creek or Pace Creek if mine water is discharged to the creek.

Typical iron and manganese concentrations in the Blackhawk Formation, Pace Creek and Dugout Creek (as summarized in previous sections) are:

	Blackhawk Formation	Dugout Creek	Pace Creek
Dissolved iron	<0.1 mg/l	<0.01 mg/l	<0.1 mg/l
Total iron	<0.5 mg/l	<1.0 mg/l	<1.0 mg/l
Dissolved manganese	--	<0.01 mg/l	–
Total manganese	<0.1 mg/l	<0.1 mg/l	<0.01 mg/l

These data indicate that the concentration of iron and manganese in Dugout Creek and Pace Creek should not be significantly affected by discharges from the mine.

Dugout Creek and Pace Creek, as part of the lower Price River basin, is classified according to Section R317-2-13 of the Utah Administrative Code (Standards of Quality for Waters of the State) as a class 2B (secondary contact recreation use), 3C (nongame fish and other aquatic life use), and 4 (agricultural use) water. No TDS standards exist for class 2B and 3C water. The TDS standard for class 4 water is 1,200 mg/l.

It should also be noted that the dissolved iron standard for class 3C water is 1.0 mg/l. No dissolved iron standard exists for class 2B or 4 waters. The data presented above indicate that potential discharge water from the mine will not exceed the dissolved iron standard of Dugout Creek or Pace Creek. No standards exist in the R317 regulations for total iron, dissolved manganese, or total manganese. However, the data presented above indicate that potential discharges from the mine to Dugout Creek and Pace Creek will meet the effluent limitations of 40 CFR 434.

Mining in the Gilson seam on the east side of the Right Fork of Dugout Creek resulted in the operator draining the flooded old Knight Ideal Mine working in August 2002 and again in May 2003 to prevent catastrophic flooding of the current Dugout Canyon Mine operations. The old workings contained water with total iron in excess of 1 mg/l and this water was discharged to Dugout Creek at a rate that at times reached 1117 gpm. As a result of draining the old workings, the water discharged to Dugout Creek did have a total iron concentration in excess of the UPDES permit limit of 1mg/l for a short period of time. It appears that water will be continuously drained from the

Knight Ideal Mine for the foreseeable future to maintain safe underground working conditions but at a discharge rate expected to be much less than 100 gpm.

No hydrologic impacts have been noted at the adjacent Soldier Canyon Mine nor at the Dugout Canyon Mine due to subsidence. Although tension cracks may locally divert water into deeper formations, resulting in increased leaching of the formation and increased TDS concentrations, the potential of this occurring is considered minimal. This conclusion is based on experience at the Soldier Canyon Mine and on the fact that the shale content of the North Horn Formation, the Price River Formation, and the Blackhawk Formation should cause these subsidence cracks to heal quickly where they are saturated by groundwater flow. Thus, potential impacts on TDS concentrations would be minor and not of significant concern. To date (January 2004), mining and subsidence within the Dugout permit area has not resulted in the loss of surface flows in the Dugout Creek drainage or impacts to ground water discharge rates at the monitored seeps and springs.

Flooding or Streamflow Alteration. Runoff from all disturbed areas will flow through a sedimentation pond or other sediment-control device prior to discharge to Dugout Creek or Pace Creek. Three factors indicate that these sediment-control devices will minimize or preclude flooding impacts to downstream areas as a result of mining operations:

1. The sedimentation pond and sediment traps have~~s~~ been designed and will be constructed to be geotechnically stable. Thus, the potential is minimized for breaches of the sedimentation pond to occur that could cause downstream flooding.
2. The flow routing that occurs through the sedimentation pond and other sediment-control devices reduces peak flows from the disturbed areas. This precludes flooding impacts to downstream areas.
3. By retaining sediment on site in the sediment-control devices, the bottom elevations of Dugout Creek and Pace Creek downstream from the disturbed area will not be artificially raised. Thus, the hydraulic capacity of the stream channel will not be altered.

The volume of streamflow will increase in Dugout Creek and Pace Creek if water is discharged from the mine to the creek. Potential impacts to the creek channel could include the displacement of fines on the channel bottom, and minor widening of the channel. However, the degree of widening will likely be minimized by the increased vigor and quantity of vegetation which will be sustained along the stream channel by the increased availability of water. In particular, it is anticipated that the deciduous streambank vegetative community (see Section 321.100) will increase in density and vigor as a result of mine-water discharges. This effect will occur for the

distance downstream that surface flows can be sustained above channel transmission losses. Care will be taken during discharge of this water to avoid flooding of downstream areas. Once mining ceases, the mine will be sealed and no discharges will occur. The streamflow in Dugout Creek and Pace Creek will then return to pre-mining discharge levels.

Following reclamation, stream channels which have been altered by mining operations will be returned to a stable state (see Section 762.100). The reclamation channels have been designed to safely pass the peak flow resulting from the 10-year, 6-hour or the 100-year, 6-hour precipitation event as appropriate for the channel and in accordance with the R645 regulations (Appendix 7-11). Thus, flooding in the reclaimed areas will be minimized. Interim sediment-control measures and maintenance of the reclaimed areas during the post-mining period will preclude deposition of significant amounts of sediment in downstream channels following reclamation, thus maintaining the hydraulic capacity of the channels and precluding adverse, off-site flooding impacts.

Subsidence tension cracks that appear on the surface will increase the secondary porosity of the formations overlying the Dugout Canyon Mine. During the period prior to healing of these cracks, this increased percolation will decrease runoff during the high-flow season (when the water would have rapidly entered the stream channel rather than flowing into the groundwater system). During low-flow periods, the result of this increased percolation will be an increase in the base flow of the stream. Hence, the net result will be a decrease in the flooding potential of the affected stream.

Subsidence under the main fork of Dugout Creek will occur in areas where overburden ranges from 600 to 1200 feet thick. The area of the least amount of overburden, approximately 600 feet, occurs in the southern half of Section 14, Township 13 South Range 12 East. Additionally, subsidence on the right hand fork of Dugout Creek will occur where overburden ranges from 500 feet to 2000 feet. The least amount of overburden on this fork of the creek occurs in the northeast quarter of Section 23, Township 13 South, Range 12 East. In both areas where the least amount of overburden occurs, the stream channels are lined with several feet of soils and fine grained sediments. Also, the upper Blackhawk Formation, which consists of interbedded shale, mudstone, siltstone, and sandstone, is exposed at the surface in a portion of these low overburden areas. The Castlegate Sandstone is present in the two low overburden areas but is rarely exposed in the channel floors.

Figure 7-11

layers in the Blackhawk Formation but does not appear to draw additional recharge from overlying or underlying groundwater systems (see Appendix 7-3).

The strong vertical gradients in Blackhawk Formation rock layers underlying actively mined coal seams in the Soldier Canyon Mine and the absence of significant discharge into the mine from these layers indicates that mining does not draw groundwater from the underling Mancos Shale. Additionally, the distinctive solute composition of Mancos Shale groundwater has not been observed inside the Soldier Canyon Mine (see Appendix 7-3).

From the above discussion, it appears that the Soldier Canyon Mine has not decreased groundwater discharge in overlying or underlying groundwater systems. Hence, it is unlikely that coal mining will effect the discharges of any spring as a result of mining in the Dugout Canyon permit and adjacent areas.

Potential for Increased Stream Flows

If sufficient water is encountered in the Dugout Canyon Mine workings to require discharge of that water to the surface, the flow of Dugout Creek and Pace Creek will be increased. To estimate the potential quantity of inflow to the Dugout Canyon Mine, the investigation of Lines (1985) was reviewed. In this investigation, Lines (1985) evaluated groundwater conditions in the Trail Mountain Area, located in the hydrogeologically-similar Wasatch Plateau approximately 23 miles southwest of the proposed Dugout Canyon Mine permit area. Using a finite-difference model, Lines (1985) evaluated potential inflows into a hypothetical coal mine in the Blackhawk Formation assuming hydraulic conductivities of 0.01 ft/day for the Blackhawk Formation and 0.02 ft/day for the Star Point Sandstone. He further assumed hydraulic gradients which varied from 0.041 ft/ft to 0.098 ft/ft. Results of these evaluations are presented in Figure 7-11.

As noted in Section 724.100, the median hydraulic conductivity of the Blackhawk Formation in the vicinity of the permit area is 5.1×10^{-4} ft/day, a factor of 20 lower than the values assumed by Lines (1985). As also noted in Section 724.100, the average hydraulic gradient of the Blackhawk Formation is 0.008 ft/ft, a factor of 5 lower than the lowest values assumed by Lines (1985). Since an increase in the hydraulic conductivity and the hydraulic gradient would tend to increase the inflow to the mine, using the evaluation of Lines (1985) should result in an overestimate of potential inflows to the Dugout Canyon Mine.

729 Cumulative Hydrologic Impact Assessment (CHIA)

A Cumulative Hydrologic Impact Assessment to include the permit and adjacent areas is to be prepared by the Division.

730 OPERATION PLAN

731 General Requirements

This permit application includes an operation plan which addresses the following:

- Groundwater and Surface Water Protection and Monitoring Plan;
- Design Criteria and Plans;
- Performance Standards; and
- Reclamation Plan.

731.100 Hydrologic-Balance Protection

Groundwater Protection. To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic, toxic, or other harmful infiltration to the groundwater system. Additionally, the permittee will manage excavations and disturbances to prevent or control discharges of pollutants to the groundwater.

As indicated in Section 728.300, it is anticipated that an average of approximately 190 gallons per minute of groundwater encountered in the mine will eventually be discharged to Dugout Creek or Pace Creek. This water will be discharged in a controlled manner, in accordance with an approved UPDES permit, via a pipeline from the mine to the creek. The Dugout Creek discharge point is anticipated to be located at the upstream inlet to the Dugout Canyon culvert, UC-5. If the discharge occurs to a point outside of the culvert, riprap will be placed at the outlet of the pipe to prevent erosion. The Pace Creek discharge point will be located southeast of the fan shaft. The pipe will discharge directly to the creek. The pipe outlet will be riprapped to prevent erosion. Any erosion that occurs at the points of discharge will be repaired as soon as practical.

Surface Water Protection. To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents, to the extent possible, additional contributions of suspended solids to streamflow outside the permit area, and otherwise prevents water pollution. Additionally, SCM will maintain adequate runoff- and sediment-control facilities to protect local surface waters.

During initial construction to develop the surface facilities, and prior to installation of all runoff- and sediment-control facilities as outlined in Section 732 of this M&RP, silt fences will be installed along the top bank of Dugout Creek and its eastern tributary in areas prior to disturbance. These silt fences will be installed in accordance with Figure 5-4. If required for control of local erosion, straw-bale dikes may also be installed at the site during initial construction. These dikes will also be installed in accordance with Figure 5-4. The silt fences and straw-bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. Once the sedimentation pond, ditches, and culverts are installed, the silt fences and straw-bale dikes may be removed.

During initial construction to develop the surface facilities in Pace Canyon, and prior to installation of all runoff- and sediment-control facilities as outlined in Appendix 7-12 of this M&RP, silt fences will be installed along the disturbed area boundary and along the tributary drainages upstream and downstream of the surface facilities. These silt fences will be installed in accordance with Figure 5-4. If required for control of local erosion, straw-bale dikes may also be installed at the site during initial construction. These dikes will also be installed in accordance with Figure 5-4. The silt fences and straw-bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. Once the sedimentation trap, ditches, and culverts are installed, the interim silt fences and straw-bale dikes will be removed.

Once the runoff- and sediment-control facilities outlined in Section 732 have been installed, these structures will prevent additional contributions of suspended solids to streamflow outside the permit area. A description of sediment control following reclamation is presented in Sections 540 and 760 of this M&RP.

731.200 Water Monitoring

Groundwater Monitoring. Groundwater monitoring to be conducted in the permit and adjacent areas will consist of data collection from monitoring wells, springs, and mine-water discharges. Locations of wells and springs to be monitored are noted on Plate 7-1. The groundwater monitoring plans presented herein were developed based on information presented in the PHC

TABLE 7-5

Surface Water Monitoring Program

Field and Laboratory Measurement Protocol

Streams	Protocol	Comments
DC-1	1	Located on Dugout Creek downstream of mine
DC-2	2	Located on Dugout Creek immediately upstream of mine on left-hand fork
DC-3	2	Located on Dugout Creek immediately upstream of mine on right-hand fork
DC-4	3	Located on Dugout Creek upstream of mine on west fork of left-hand fork
DC-5	3	Located on Dugout Creek upstream of mine on east fork of left-hand fork
PC-1a	2	Located on Pace Creek on the eastern edge of State Coal Lease ML 48435-OBA
PC-2	2	Located on Pace Creek on the western edge of State Coal Lease ML 48435-OBA
RC-1	2	Located on Rock Creek on the southern edge of State Coal Lease ML 48435-OBA
FAN	1	Located on Pace Creek above fan facilities

Protocols

1 Stream: quarterly operational surface water quality measurements analyzed as per parameters listed below.

2 Stream: quarterly operational surface water quality measurements analyzed as per parameters listed below except during first wet or dry years when weekly flow will be obtained from April 1 through August 31, as conditions permit, in addition to quarterly samples.

3 Stream: weekly flow measurements during first wet or dry year will be obtained from April 1 through August 31 as conditions permit. Also during the first wet or dry year, one operational laboratory sample and one tritium sample will be obtained at these sites during high and low flow season.

Surface Water Quality Parameters

FIELD MEASUREMENTS	REPORTED AS
Flow	gpm or cfs
pH	pH units
Specific Conductivity	μs/cm @ 25°C
Dissolved Oxygen	mg/l
Temperature	°C

Laboratory Parameters	Reported As	Operational Monitoring	Baseline Monitoring
Acidity	mg/l		X
Aluminum (Dissolved)	mg/l		X
Ammonia	mg/l		X
Arsenic (Dissolved)	mg/l		X

2. Water samples will be obtained during high- and low-flow season in conjunction with the quarterly sampling, if applicable. The samples will be analyzed in accordance with Table 7-4 with the addition of tritium analysis.

In addition to the above regular monitoring, one water sample will be collected at each spring sampling point during low flow period every fifth year, during the year preceding re-permitting, to be analyzed for baseline parameters (Table 7-4).

Groundwater was discovered discharging from old Gilson coal seam workings located on the east side of Dugout Canyon during construction of the Dugout Canyon Mine in September 1998. Prior to construction, this water seeped unnoticed through unconsolidated fill and into Dugout Creek. The water discharging from these old workings will be monitored on a quarterly basis for the parameters listed in Table 7-4 beginning in the fourth quarter of 1998. The monitoring point is labeled MD-1 on Plate 7-1.

Data will be collected from the Dugout Canyon Mine and Pace Canyon Fan Portal mine-water discharge point in accordance with the UPDES permits. No water will be discharged prior to obtaining the necessary UPDES permits. The monitoring requirements proposed herein, including the analytical parameters and the sampling frequency, may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified.

Data will be collected under the groundwater monitoring program every year following the completion of surface reclamation activities. During the post-mining period, water levels will be collected from the monitoring wells and data/samples will be collected from the identified springs once each year during September or October (i.e., the low-flow season while the sites are still accessible). Groundwater monitoring during the post-mining period will continue until bond release.

All groundwater monitoring data will be submitted to the Division by the end of the quarter following sampling. If analyses of any groundwater sample indicates noncompliance with the permit conditions, the permittee will promptly notify the Division and take immediate appropriate actions. UPDES reporting requirements will be met for the mine-water discharge points. The Snotel data used to determine "wet" or "dry" years, as described previously in this section, will be submitted with the first quarter water monitoring data beginning in the year 2001.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of groundwater in the permit and adjacent areas have been or will be installed, maintained,

and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by the permittee when no longer needed.

Surface Water Monitoring. Surface water monitoring to be conducted in the permit and adjacent areas will consist of data collection from streams and sedimentation pond discharges. Locations of streams to be monitored are noted on Plate 7-1. The surface water monitoring plans presented herein were developed based on information presented in the PHC determination, the baseline hydrologic data, and the geologic data presented in Chapter 6 of this M&RP.

Station DC-1 will be monitored to evaluate surface-water conditions downstream from the proposed surface facilities. Stations DC-2 and DC-3 will provide data concerning background surface-water conditions immediately upstream from the proposed surface facilities. Stations DC-4 and DC-5 will be located at the Castlegate Sandstone-Blackhawk Formation contact and will provide data that will be used to determine the relationship between the Blackhawk Formation and the base flow of Dugout Creek.

PC-1a and PC-2 are located on Pace Creek and will be monitored to evaluate surface-water conditions up gradient and down gradient, respectively, of the permit area. Monitoring point (Fan) has been added on Pace Creek at a location approximately 600 feet upstream from the top of the Pace Canyon Fan facilities disturbed area boundary. Monitoring locations Fan and PC-2 will be monitored to evaluate surface water conditions up gradient and down gradient , respectively, of the Pace Canyon Fan facilities. RC-1 has also been established as monitoring point to obtain baseline data for future mine expansion. Baseline data will be obtained from the aforementioned three sites for three years prior to initiating operational sampling.

Protocols for surface-water monitoring within the permit and adjacent areas are:

- DC-1, FAN - Quarterly data collection in accordance with Table 7-5 (operational parameters). This table is the same as that presented in Coal Regulatory Program Directive Tech-004, with the exception that total hardness and total alkalinity are not included. As explained above, total hardness, which is primarily of concern in water supplies being developed for domestic use, was not added to the list because summer-home development of the permit area is not an identified post-mining land use. Total alkalinity was not added to the list because the baseline data indicate that acid-generating materials, which may affect the alkalinity of the water, are not present within the permit and adjacent areas.

- DC-2, DC-3, PC-1a, PC-2, and RC-1 - Quarterly data collection in accordance with Table 7-5. Collection of gain-loss hydrograph data during the first wet year and the first dry year

731.300 Acid- and Toxic-Forming Materials

Analyses presented in Chapter 6 of this M&RP indicate that acid- and toxic-forming materials are not present within the permit area. Parameters defining acid- and toxic-forming materials will periodically be monitored as described in Chapter 6 of this M&RP. In the event that acid- or toxic-forming materials are identified, they will be disposed of in appropriate waste-rock disposal facilities as described in Chapter 5 of this M&RP.

731.400 Transfer of Wells

Before final release of bond, exploration or monitoring wells will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-301-765. Ownership of wells will be transferred only with prior approval of the Division. The conditions of such a transfer will comply with State and local laws. The permittee will remain responsible for the management of the wells until bond release in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

731.500 Discharges

Discharges into an Underground Mine. No discharges of surface water will be made to an underground mine in the permit and adjacent areas.

Gravity Discharges from an Underground Mine. No gravity discharges will be made from an underground mine in the permit and adjacent areas.

731.600 Stream Buffer Zones

The surface facilities for the Dugout Canyon Mine will be constructed within 100 feet of Dugout Creek (a perennial stream, intermittent adjacent to mine facilities) and Pace Creek (an intermittent stream adjacent to fan facilities). However, surface runoff- and sediment-control facilities designed for the site (as discussed in subsequent sections of this chapter) will ensure that coal mining and reclamation operations will not cause or contribute to the violation of applicable Utah or federal water standards and will not adversely affect the water quantity and quality or other environmental resources of the stream.

Stream Channel Diversions. Temporary or permanent stream channel diversions will comply with R645-301-742.300.

Buffer Zone Designation. The area surrounding the streams that is not to be disturbed will be designated as a buffer zone, and SCM will mark those zones as specified in Section 521.200 of this M&RP.

731.700 Cross Sections and Maps

The locations of water rights for current users of surface water flowing into, out of, and within the permit and adjacent areas is provided on Plate 7-2. The locations of each water diversion, collection, conveyance, treatment, storage, and discharge facility to be used in the Dugout Canyon area is presented on Plate 7-5 or in Addendum A to Appendix 7-9.

Locations and elevations of each station to be used for water monitoring during coal mining and reclamation operations are presented on Plate 7-1. The design details and cross sections for the sedimentation pond are provided on Plate 7-4. Other relevant cross sections or maps are presented and discussed in Chapter 5 of this M&RP.

731.800 Water Rights and Replacement

No surface mining will occur in the Dugout Canyon Mine permit area.

732 Sediment Control Measures

The sediment control measures within the permit area have been designed to prevent additional contributions of sediment to streamflow or to runoff outside the permit area. In addition, they have been designed to meet applicable effluent limitations, and minimize erosion to the extent possible.

The structures to be used for the runoff-control plan for the permit area include disturbed and undisturbed area diversion channels, a sedimentation pond, containment berms, silt fences, and road diversions and culverts.

Sediment control measures for the Pace Canyon Fan Portal Area are discussed in Appendix 7-12.

733 Impoundments

733.100 General Plans

There will be a single sedimentation pond operating at the mine facility as described in Section 732.200. The sedimentation pond will be located in the southwest corner of the disturbed area. The sedimentation pond topography and cross sections are presented on Plate 7-4 of this M&RP. Detailed design information is presented in Appendix 7-8. Details regarding the impoundments at the Pace Canyon Fan Portal Site can be found in Appendix 7-12.

Certification. All maps and cross sections of the sedimentation pond have been prepared by or under the direction of, and certified by a qualified, registered, professional engineer.

Maps and Cross Sections. The topography and cross sections for the sedimentation pond are provided on Plate 7-4 of this M&RP.

Narrative. A description of the sedimentation pond is presented in Sections 732.200 and 742 of this M&RP.

Subsidence Survey Results. No underground coal mining will occur beneath the proposed sedimentation pond. Therefore, there will be no effects on the pond or pond embankment from subsidence.

Hydrologic Impact. The hydrologic and geologic information required to assess the hydrologic impacts of the proposed sedimentation pond are presented in Section 724 and Chapter 6 of this M&RP, respectively.

Design Plans and Construction Schedule. There are no additional structures proposed for the mining operation at this time. Any structures proposed in the future will not be constructed until the Division has approved the detailed design plan for the structure.

733.200 Permanent and Temporary Impoundments

Requirements. The sedimentation pond has been designed using current, prudent engineering practices. Specific foundation design and construction criteria are presented in Chapter 5 of this M&RP. Specific hydrologic design criteria for the pond are presented in Section 743. The pond will be inspected regularly based on the schedule contained in Section 514.300.

Permanent Impoundments. There are no permanent impoundment structures proposed for use in mining and reclamation operations within the permit and adjacent areas.

Temporary Impoundments. The Division's authorization is being sought for the construction of the sedimentation pond as a temporary impoundment at the mine as part of coal mining and reclamation operations.

Hazard Notifications. The sedimentation pond will be examined for structural weakness and erosion in accordance with the schedule presented in Section 514.300. A report of these findings will be submitted to the Division as outlined in Section 514.300.

734 Discharge Structures

Discharge structures within the Dugout Canyon Mine facilities area will consist of the primary and emergency spillway on the sedimentation pond and a discharge line from the underground workings. Discharge structures at the Pace Canyon Fan Portal Site will consist of a spillway from the sediment trap and discharge line (UPDES) from the underground workings. All discharge structures will be constructed and maintained to comply with R645-301-744.

735 Disposal of Excess Spoil

There will be no excess spoil generated at the mine.

736 Coal Mine Waste

Coal mine waste will be stored and disposed of as described in Chapter 5.

740 DESIGN CRITERIA AND PLANS

741 General Requirements

This M&RP includes site-specific plans that incorporate minimum design criteria for the control of drainage from disturbed and undisturbed areas. The design criteria and plans for the Pace Canyon Fan Portal Site can be found in Appendix 7-12.

742 Sediment Control Measures

742.100 General Requirements

Design. Sediment-control measures have been designed to provide the following:

- Prevent additional contributions of sediment to stream flow or to runoff outside the permit area;
- Meet the effluent limitations defined in Section 751; and
- Minimize erosion to the extent possible.

Measures and Methods. The sediment control measures at the mine will include practices carried out within and adjacent to the disturbed area. Sediment control methods will include:

- Retention of sediment within the disturbed area;
- Diversion of runoff away from the disturbed area;
- Diversion of runoff using channels or culverts through disturbed areas to prevent additional erosion;
- Provision of silt fences, riprap, contemporaneous revegetation, vegetative sediment filters, a sedimentation pond, and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment; and
- Treatment of mine drainage in underground sumps.

A sediment trap was constructed in the ditch on the southeast side of the disturbed area as shown on Figure 1 in Addendum A to Appendix 7-9. The trap was installed to collect sediment prior to it reaching the pond, therefore requiring less frequent sediment pond cleaning. The sediment trap has been fully designed to pass design flows, regardless of the quantity of sediment and/or ice collected in the trap. Sediment accumulations within the trap would not be considered a compliance concern. If the trap is unable to direct the water to the pond through culvert DC-11 (24" CMP), the water will flow through the trap and proceed down the existing ditch into the sediment pond.

A sediment basin was constructed above the inlet to culvert DC-10. The function of the sediment basin and sediment trap will be the same, both will pass the design flow regardless of the quantity of sediment in the trap/basin and sediment accumulation will not be a compliance concern. The trap/basin designs are located in Addendum A to Appendix 7-9.

A sediment trap will be constructed in association with the Pace Canyon Fan Portal site. Details regarding this sediment trap can be found in Appendix 7-12.

752.100 Siltation Structures and Diversions

Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 732, 742, and 763 of this M&RP.

752.200 Road Drainage

All roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to plans and designs presented in Sections 732.400, 742.400, and 762 of this M&RP. All roads have been designed to:

- Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices;
- Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;
- Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under Section 751;

- Minimize the diminution to or degradation of the quality or quantity of surface- and groundwater systems; and
- Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

753 Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed as described in Sections 733, 734, 743, 745, and 760 of this M&RP.

754 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Disposal areas for coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed as described in Sections 736, 737, 746, 747, 760 and Chapter 5 of this M&RP.

755 Casing and Sealing of Wells

All wells will be managed as described in Sections 551, 748 and 765 of this M&RP.

760 RECLAMATION

761 General Requirements

A detailed reclamation plan for the mine is presented in Section 540. In general, SCM will ensure that all temporary structures are removed and reclaimed. Other than for restoration of natural drainage patterns and drainage features associated with the water-tank access road (which will be retained for access to private land as part of the post-mining land use), no permanent diversions are included in the reclamation plan.

762 Roads

A road not to be retained for use under an approved post-mining land use will be reclaimed immediately after it is no longer needed for coal mining and reclamation operations.

762.100 Restoring the Natural Drainage Patterns

All natural drainage patterns will be restored during reclamation. Details regarding the reclamation of stream channels are provided in Appendix 7-11. As noted in that appendix and on Plate 5-5, the following channels will be restored during reclamation:

Channel	Location
RD-1	Upstream ephemeral tributary on the west side of Dugout Creek
RD-2	Middle ephemeral tributary on the west side of Dugout Creek
RD-3	Eastern perennial tributary of Dugout Creek
RD-4	Upper Dugout Creek
RD-5	Dugout Creek below confluence of RD-3 and RD-4
RD-6	Ephemeral channel across the reclaimed survey monument access road
RD-7	Upstream ephemeral tributary on the east side of Dugout Creek
RD-8	Middle ephemeral tributary on the east side of Dugout Creek
RD-9	Downstream ephemeral tributary on the west side of Dugout Creek
RD-10	Downstream ephemeral tributary on the east side of Dugout Creek

In accordance with R645-301-742.333, channels RD-1, RD-2, and RD-6 through RD-10 were designed to safely convey the peak flow resulting from the 10-year, 6-hour precipitation event. With the exception of RD-10, each channel was designed with a bottom width of 1 foot, a channel depth of 1 foot, 2H:1V side slopes, and a median riprap diameter of 3 inches. The riprap will be installed in these ephemeral drainages as an extra erosion-protection measure, even though design velocities are not expected to be erosive. RD-10 was designed with a similar cross section, but with a median riprap diameter of 6 inches.

During reclamation of the Pace Canyon Fan Portal Site two drainages will be affected. Both drainages had been disturbed by the road building activities prior to the construction of the Dugout Canyon Mine and Pace Canyon Fan Portal Facilities. In both drainages a section of the channel had been destroyed by the road construction. During reclamation these drainages will be reestablished. Reclamation channel PCRD-1 will be constructed in the drainage south of the portal with the exception of where the channel crosses the road. At the road crossing a swale will be constructed. Reclamation channel PCRD-1 will be constructed with a bottom width of 2.5 feet, side slopes of 2:1, depth of 1 foot and D_{50} = 6 inch riprap. The swale will have side slopes of 7.5:1 and a depth of 1 foot. The culvert in the drainage north of the site will be replaced by a swale with a

bottom width of 5 feet, side slopes of 7.5:1 and a depth of 1 foot. In accordance with R645-301-742.333, these channels were designed to safely convey the peak flow resulting from the 10-year, 6-hour precipitation event. See Plate PC5-5 in Appendix 5-10 and Attachment 3 in Appendix 7-12 for the reclamation channel location and calculations respectively.

As a result of pre-SMCRA disturbances at the site, Dugout Creek and its eastern tributary have experienced significant instability. This instability is especially noteworthy in a 300-foot section of Dugout Creek near the central portion of the proposed disturbed area. In this section, past blockage of a culvert installed by prior operators resulted in a re-routing of the creek, together with extensive downcutting (both up- and downstream from the blockage) and erosion of the site. The results of this damage are evident throughout, as well as up- and downstream from, the proposed disturbed area as headcutting and deposition have occurred.

SCM is committed to restoring the Dugout Creek channel to a more natural functioning condition as a result of site reclamation. In an effort to determine the best means for accomplishing this channel restoration, Dugout Creek was evaluated within the proposed disturbed and adjacent areas by Mr. Galen W. Williams of EarthFax Engineering, Inc. Mr. Williams, who is a registered Professional Geologist in the state of Wyoming, received a Master of Science degree in Applied Geomorphology from the University of Utah in 1981. Since that time, he has performed multiple stream and river channel morphology studies as they relate to proposed hydroelectric projects and dams. His geographical area of expertise includes Utah, Idaho, Oregon, Washington, and Hawaii. Past work performed by Mr. Williams has included evaluations of the long-term morphological changes which occur to streams as a result of water development, including the development of designs to minimize the impacts of reduced flows resulting from diversion into penstocks and increased flows downstream from spillways and hydroelectric plant discharges.

Mr. Williams concluded from his site visit that Dugout Creek can currently be classified as a Type A4 stream (using the stream classification system of Rosgen, 1996). The "A" in the classification indicates that this stream type is generally entrenched and is characterized by a steep gradient (typically 4 to 10 percent) with a low width-to-depth ratio and low sinuosity. The "4" in the classification indicates that the channel material is generally composed of gravel, with lesser amounts of boulders, cobbles, sand, and fines. In its current form, the channel is very unstable and appears to be undergoing frequent change. Based on measurements collected by Mr. Williams

APPENDIX 7-6

UPDES Permit Applications

ADD TO THE BACK OF EXISTING INFORMATION

Permit No. UT0025593
Minor Industrial

STATE OF UTAH
DIVISION OF WATER QUALITY
DEPARTMENT OF ENVIRONMENTAL QUALITY
SALT LAKE CITY, UTAH

AUTHORIZATION TO DISCHARGE UNDER THE

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM
(UPDES)

In compliance with provisions of the Utah *Water Quality Act, Title 19, Chapter 5, Utah Code Annotated ("UCA") 1953, as amended* (the *"Act"*),

CANYON FUEL COMPANY, LLC – DUGOUT CANYON MINE

is hereby authorized to discharge from its facility located near Wellington, Utah, with the outfall(s) located as indicated in this permit, to receiving waters named

Dugout Creek and an unnamed tributary of Grassy Trail Creek.

in accordance with discharge points, effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective December 1, 2004.

This permit and the authorization to discharge shall expire at midnight, November 30, 2009

Signed this 30th day of November 2004.

Authorized Permitting Official
Executive Secretary
Utah Water Quality Board

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Definitions.

1. The "30-day (and monthly) average" is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

2. The "7-day (and weekly) average" is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self- monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

3. "Daily Maximum" ("Daily Max.") is the maximum value allowable in any single sample or instantaneous measurement.

4. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

5. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

6. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

7. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

8. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

9. "Executive Secretary" means Executive Secretary of the Utah Water Quality

Board.

10. "EPA" means the United States Environmental Protection Agency.

11. "Act" means the "*Utah Water Quality Act*".

12. "Best Management Practices" ("*BMPs*") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. *BMPs* also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

13. "Coal pile runoff" means the rainfall runoff from or through any coal storage pile.

14. "*CWA*" means *The Federal Water Pollution Control Act*, as amended, by *The Clean Water Act of 1987*.

15. "Illicit discharge" means any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to a *UPDES* permit (other than the *UPDES* permit for discharges from the municipal separate storm sewer) and discharges from fire fighting activities, fire hydrant flushings, potable water sources including waterline flushings, uncontaminated ground water (including dewatering ground water infiltration), foundation or footing drains where flows are not contaminated with process materials such as solvents, springs, riparian habitats, wetlands, irrigation water, exterior building washdown where there are no chemical or abrasive additives, pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred and where detergents are not used, and air conditioning condensate.

16. "Landfill" means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

17. "Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharges. This term does not include return flows from irrigated agriculture or agriculture storm water runoff.

18. "Runoff coefficient" means the fraction of total rainfall that will appear at a conveyance as runoff.

19. "Section 313 water priority chemical" means a chemical or chemical categories which:

a. are listed at *40 CFR 372.65* pursuant to *Section 313* of *Title III* of the *Emergency Planning and Community Right-to-Know Act (EPCRA)* (also known as *Title III* of the *Superfund Amendments and Reauthorization Act (SARA)* of 1986);

b. are present at or above threshold levels at a facility subject to *EPCRA, Section 313* reporting requirements, and

c. meet at least one of the following criteria:

(1) are listed in *Appendix D* of *40 CFR 122* on either *Table II* (organic priority pollutants), *Table III* (certain metals, cyanides, and phenols) or *Table IV* (certain toxic pollutants and hazardous substances);

(2) are listed as a hazardous substance pursuant to *Section 311(b)(2)(A)* of the *CWA* at *40 CFR 116.4*; or

(3) are pollutants for which EPA has published acute or chronic toxicity criteria.

20. "Significant materials" includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under *Section 101(14)* of *CERCLA*; any chemical the facility is required to report pursuant to *EPCRA Section 313*; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with storm water discharges.

21. "Significant spills" includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under *Section 311* of the *Clean Water Act* (see *40 CFR 110.10* and *40 CFR 117.21*) or *Section 102* of *CERCLA* (see *40 CFR 302.4*).

22. "Storm water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

23. "Waste pile" means any noncontainerized accumulation of solid, nonflowing waste that is used for treatment or storage.

24. "10-year, 24-hour precipitation event" means the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years. This information is available in *Weather Bureau Technical Paper No. 40*, May 1961 and *NOAA Atlas 2*, 1973 for the 11 Western States, and may be obtained from the National Climatic Center of the Environmental Data Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

B. Description of Discharge Point(s).

The authorization to discharge provided under this permit is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under a UPDES permit is a violation of the *Act* and may be subject to penalties under the *Act*. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge may be subject to criminal penalties as provided under the *Act*.

Outfall Number	Location of Discharge Point(s)
001	Mine water discharge to Dugout Creek. Latitude 39E 41'01", Longitude 110E 32' 44".
002	Sedimentation pond discharge to Dugout Creek. Latitude 39E 40' 56", Longitude 110E 32' 52
003	Mine water discharge to Dugout Creek. Latitude 39E 41' 18", Longitude 110E 32' 29".
004	Sedimentation pond (waste rock site) discharge to an unknown tributary of Grassy Trail Creek. Latitude 39E 36' 40", Longitude 110E 36' 43".

C. Narrative Standard.

It shall be unlawful, and a violation of this permit, for the permittee to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum or other nuisances such as color, odor or taste, or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by bioassay or other tests performed in accordance with standard procedures.

D. Specific Limitations and Self-monitoring Requirements.

1. Effective immediately and lasting the duration of this permit, the permittee is authorized to discharge from Outfalls 001, 002, 003, and 004. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations a/ Average 30-Day	7-Day	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, mgd	NA	NA	NA	2 X Monthly	Instantaneous
Total Iron, mg/L	NA	NA	1.1	2 X Monthly	Grab
Oil & Grease, mg/L	NA	NA	10	2 X Monthly	Visual/Grab b/
Total Suspended Solids, mg/L	25	35	70	2 X Monthly	Grab
Total Dissolved Solids, mg/L c/	500	NA	2400	2 X Monthly	Grab
Total Dissolved Solids, tons/day c/	NA	NA	1.0	2 X Monthly	Grab

The pH shall not be less than 6.5 standard units (S.U.) nor greater than 9.0 S.U. in any sample and shall be monitored by a grab sample.

There shall be no visible sheen or floating solids or visible foam in other than trace amounts.

There shall be no discharge of sanitary wastes.

N.A. - Not Applicable.

a/ See Definitions, *Part I.A* for definition of terms.

b/ Oil and grease shall be a visual test. If any oil and grease sheens are observed visually, then a sample of the effluent must be taken and this sample shall not exceed 10 mg/L.

c/ The TDS concentration from each of the outfalls shall not exceed 2400 mg/L as a daily maximum limit. No tons per day loading limit will be applied if the concentration of TDS in the discharge is equal to or less than 500 mg/L as a thirty-day average. However, if the 30-day average concentration exceeds 500 mg/L, then the permittee cannot discharge more than 1.0 ton per day as a sum from all discharge points. Upon determination by the Executive Secretary that the permittee is not able to meet the 500 mg/L 30-day average or the 1.0 ton per day loading limit, the permittee is required to participate in and/or fund a salinity offset project to include TDS offset credits, within six (6) months of the effective date of this permit.

The salinity offset project shall include TDS credits on a ton-for-ton basis for which the permittee is over the 1.0 ton per day loading limit. The tonnage reduction from the offset project must be calculated by a method similar to one used by the NRCS, Colorado River Basin Salinity Control Forum, or other applicable agency.

If the permittee will be participating in the construction and implementation of a salinity offset project, then a project description and implementation schedule shall be submitted to the Executive Secretary within six (6) months of the effective date of the permit, which will then be reviewed for approval. The salinity offset project description and implementation schedule must be approved by the Executive Secretary and shall be appended to this permit.

If the permittee is funding a salinity offset project through third parties, the permittee shall provide satisfactory evidence to the Executive Secretary that the required funds have been deposited to the third party within six (6) months of the effective date of the permit. A monitoring and adjustment plan to track the TDS credits shall also be submitted to the Executive Secretary within six (6) months of the effective date of the permit, which will then be reviewed for approval. The monitoring and adjustment plan must be approved by the Executive Secretary and shall be appended to this permit.

2. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations: at all outfalls prior to mixing with the receiving water.

3. Any overflow, increase in volume of a discharge or discharge from a bypass system caused by precipitation within a 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snow-melt of equivalent volume) at outfalls 002 and 004 may comply with the following limitation instead of the otherwise applicable limitations contained in Part I.D.1:

Effluent Characteristic	Daily Maximum
Settleable Solids	0.5 mL/L
pH	6.5 to 9.0 S.U.

In addition to the monitoring requirements specified under Part I.D.1., all effluent samples collected during storm water discharge events may also be analyzed for settleable solids. Such analyses shall be conducted twice per month by grab samples.

4. Any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) at outfalls 002 and 004 may comply with the following limitations instead of the otherwise applicable limitations:

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units. However as stated in Part I.D.3, all effluent samples collected during storm-water discharge events may be analyzed for settleable solids in addition to the parameters identified under Part I.D.1.

5. The operator shall have the burden of proof that the discharge or increase in discharge was caused by the applicable precipitation event described in Parts

I.D.3 and 4. The alternate limitations in Parts I.D.3 and 4 shall not apply to treatment systems that treat underground mine water only.

E. Storm Water Requirements. . It has been determined that Dugout Mine has a regulated storm water discharge as per UAC R317-8-3.9., therefore, the following permit conditions governing storm water discharges apply.

1. Coverage of This Section.

a. Discharges Covered Under This Section. The requirements listed under this section shall apply to storm water discharges from Dugout Mine, subject to effluent limitations listed in Part I.D. of this permit.

1) Site Coverage. Storm water discharges from the following portions of Dugout may be eligible for this permit: haul roads (nonpublic roads on which coal or coal refuse is conveyed), access roads (nonpublic roads providing light vehicular traffic within the facility property and to public roadways), railroad spurs, sidings, and internal haulage lines (rail lines used for hauling coal within the facility property and to offsite commercial railroad lines or loading areas), conveyor belts, chutes, and aerial tramway haulage areas (areas under and around coal or refuse conveyor areas, including transfer stations), equipment storage and maintenance yards, coal handling buildings and structures, and inactive coal mines and related areas (abandoned and other inactive mines, refuse disposal sites and other mining-related areas on private lands).

2. Prohibition of Non-storm Water Discharges.

a. The following non-storm water discharges may be authorized by this permit provided the non-storm water component of the discharge is in compliance with this section; fire fighting activities; fire hydrant flushings; potable water sources including waterline flushings; drinking fountain water; irrigation drainage, lawn watering; routine external building washdown water where detergents or other compounds have not been used in the process; pavement washwaters where spills or leaks of toxic or hazardous materials (including oils and fuels) have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

3. Storm Water Pollution Prevention Plan Requirements. Most of the active coal mining-related areas, described in paragraph 1. above, are subject to sediment and erosion control regulations of the U.S. Office of Surface Mining (OSM) that enforces the Surface Mining Control and Reclamation Act (SMCRA). OSM has

granted authority to the Utah Division of Oil Gas and Mining (DOGM) to implement SMCRA through State SMCRA regulations. All SMCRA requirements regarding control of erosion, siltation and other pollutants resulting from storm water runoff, including road dust resulting from erosion, shall be primary requirements of the pollution prevention plan and shall be included in the contents of the plan directly, or by reference. Where determined to be appropriate for protection of water quality, additional sedimentation and erosion controls may be warranted.

a. Contents of Plan. The plan shall include at a minimum, the following items:

1) Pollution Prevention Team. Each plan shall identify a specific individual or individuals within the facility organization as members of a storm water Pollution Prevention Team that are responsible for developing the storm water pollution prevention plan and assisting the facility manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

2) Description of Potential Pollutant Sources. Each plan shall provide a description of potential sources that may reasonably be expected to add significant amounts of pollutants to storm water discharges or that may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials that may potentially be significant pollutant sources. Each plan shall include, at a minimum:

a) Deadlines for Plan Preparation and Compliance
Dugout Mine shall prepare and implement a plan in compliance with the provisions of this section within 270 days of the effective date of this permit.

b) Keeping Plans Current

Dugout Mine shall amend the plan whenever there is a change in design, construction, operation, or maintenance, that has a significant effect on the potential for the discharge of pollutants to the waters of the State or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified by the plan, or in otherwise achieving the general objectives of controlling pollutants in storm water discharges associated with the activities at the mine.

c) Drainage.

(1) A site map, such as a drainage map required for SMCRA permit applications, that indicate drainage areas and storm water outfalls. These shall include but not be limited to the following:

(a) Drainage direction and discharge points from all applicable mining-related areas described in paragraph 1.a(1). (Site Coverage) above, including culvert and sump discharges from roads and rail beds and also from equipment and maintenance areas subject to storm runoff of fuel, lubricants and other potentially harmful liquids.

(b) Location of each existing erosion and sedimentation control structure or other control measures for reducing pollutants in storm water runoff.

(c) Receiving streams or other surface water bodies.

(d) Locations exposed to precipitation that contain acidic spoil, refuse or unreclaimed disturbed areas.

(e) Locations where major spills or leaks of toxic or hazardous pollutants have occurred.

(f) Locations where liquid storage tanks containing potential pollutants, such as caustics, hydraulic fluids and lubricants, are exposed to precipitation.

(g) Locations where fueling stations, vehicle and equipment maintenance areas are exposed to precipitation.

(h) Locations of outfalls and the types of discharges contained in the drainage areas of the outfalls.

(2) For each area of the facility that generates storm

water discharges associated with the mining-related activity with a reasonable potential for containing significant amounts of pollutants, a prediction of the direction of flow, and an identification of the types of pollutants that are likely to be present in storm water discharges associated with the activity. Factors to consider include the toxicity of the pollutant; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified.

d) Inventory of Exposed Materials. An inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water method and location of onsite storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

e) Spills and Leaks. A list of significant spills and leaks of toxic or hazardous pollutants that occurred at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility beginning 3 years prior to the effective date of this permit. Such list shall be updated as appropriate during the term of the permit.

f) Sampling Data. A summary of any existing discharge sampling data describing pollutants in storm water discharges from the portions of Dugout covered by this permit, including a summary of any sampling data collected during the term of this permit.

g) Risk Identification and Summary of Potential Pollutant Sources. A narrative description of the potential pollutant sources from the following activities: truck traffic on haul roads and resulting generation of sediment subject to runoff and dust generation; fuel or other liquid storage; pressure lines containing slurry, hydraulic fluid or other potential harmful liquids; and loading or temporary storage of acidic refuse or spoil. Specific

potential pollutants shall be identified where known.

3) Measures and Controls. Dugout Mine shall develop a description of storm water management controls appropriate for the facility and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at Dugout Mine. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls.

a) Good Housekeeping. Good housekeeping requires the maintenance of areas that may contribute pollutants to storm water discharges in a clean, orderly manner. These are practices that would minimize the generation of pollutants at the source or before it would be necessary to employ sediment ponds or other control measures at the discharge outlets. Where applicable, such measures or other equivalent measures would include the following: sweepers and covered storage to minimize dust generation and storm runoff; conservation of vegetation where possible to minimize erosion; watering of haul roads to minimize dust generation; collection, removal, and proper disposal of waste oils and other fluids resulting from vehicle and equipment maintenance; or other equivalent measures.

b) Preventive Maintenance. A preventive maintenance program shall involve timely inspection and maintenance of storm water management devices as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems. Where applicable, such measures would include the following: removal and proper disposal of settled solids in catch basins to allow sufficient retention capacity; periodic replacement of siltation control measures subject to deterioration such as straw bales; inspections of storage tanks and pressure lines for fuels, lubricants, hydraulic fluid or slurry to prevent leaks due to deterioration or faulty connections; or other equivalent measures.

c) Spill Prevention and Response Procedures. Areas where potential spills that can contribute pollutants to storm water discharges can occur, and their accompanying drainage points shall be identified clearly in the storm

water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a clean up shall be available to personnel.

d) Inspections. In addition to or as part of the comprehensive site evaluation required under paragraph 3.a.(4) of this section, qualified facility personnel shall be identified to inspect designated areas of the facility at appropriate intervals specified in the plan. The following shall be included in the plan:

(1) Active Mining-Related Areas and Those Inactive Areas Under SMCRA Bond Authority. The plan shall require quarterly inspections by the facility personnel for areas of the facility covered by pollution prevention plan requirements. This inspection interval corresponds with the quarterly inspections for the entire facility required to be provided by SMCRA authority inspectors for all mining-related areas under SMCRA authority, including sediment and erosion control measures. Inspections by the facility representative may be done at the same time as the mandatory inspections performed by SMCRA inspectors. Records of inspections of the SMCRA authority facility representative shall be maintained.

(2) Inactive Mining-Related Areas Not Under SMCRA Bond. The plan shall require annual inspections by the facility representative except in situations referred to in paragraph 3.a.(4)(d) below.

(3) Inspection Records. The plan shall require that inspection records of the facility representative and those of the SMCRA authority inspector shall be maintained. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections.

e) Employee Training. Employee training programs shall inform personnel responsible for implementing activities

identified in the storm water pollution prevention plan or otherwise responsible for storm water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The pollution prevention plan shall identify periodic dates for such training.

f) Record keeping and Internal Reporting Procedures. A description of incidents (such as spills, or other discharges) along with other information describing the quality and quantity of storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.

g) Non-storm Water Discharges.

(1) Certification. The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges such as drainage from underground portions of inactive mines or floor drains from maintenance or coal handling buildings. The certification shall include the identification of potential significant sources of non-storm water discharges at the site, a description of the results of any test and/or evaluation, a description of the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the onsite drainage points that were directly observed during the test. Certifications shall be signed in accordance with Part IV.G.4. of this permit.

(2) Exceptions. Except for flows from fire fighting activities, authorized sources of non-storm water listed in Part I.E.2.a. that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

(3) Failure to Certify. If Dugout Mine is unable to provide the certification required (testing or other evaluation for non-storm water discharges), the

Executive Secretary must be notified within 180 days after the effective date of this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification shall describe: the procedure of any test conducted for the presence of non-storm water discharges; the results of such test or other relevant observations; potential sources of non-storm water to the storm discharge lines; and why adequate tests for such storm discharge lines were not feasible. Non-storm water discharges to waters of the State that are not authorized by a UPDES permit are unlawful, and must be terminated.

h) Sediment and Erosion Control. The plan shall identify areas that, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion and reduce sediment concentrations in storm water discharges. As indicated in paragraph I.E.3. above, SMCRA requirements regarding sediment and erosion control measures are primary requirements of the pollution prevention plan for mining-related areas subject to SMCRA authority. The following sediment and erosion control measures or other equivalent measures, should be included in the plan where reasonable and appropriate for all areas subject to storm water runoff:

(1) Stabilization Measures. Interim and permanent stabilization measures to minimize erosion and lessen amount of structural sediment control measures needed, including: mature vegetation preservation; temporary seeding; permanent seeding and planting; temporary mulching, matting, and netting; sod stabilization; vegetative buffer strips; temporary chemical mulch, soil binders, and soil palliatives; nonacidic road surfacing material; and protective trees.

(2) Structural Measures. Structural measures to lessen erosion and reduce sediment discharges, including: silt fences; earth dikes; straw dikes; gradient terraces; drainage swales; sediment traps; pipe slope drains; porous rock check dams; sedimentation ponds; riprap channel protection; capping of contaminated sources; and

physical/chemical treatment of storm water.

i) Management of Flow. The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (other than those as sediment and erosion control measures listed above) used to manage storm water runoff in a manner that reduces pollutants in storm water runoff from the site. The plan shall provide that the measures, which the permittee determines to be reasonable and appropriate, shall be implemented and maintained. Appropriate measures may include: discharge diversions; drainage/storm water conveyances; runoff dispersion; sediment control and collection; vegetation/soil stabilization; capping of contaminated sources; treatment; or other equivalent measures.

4) Comprehensive Site Compliance Evaluation. Qualified personnel shall conduct site compliance evaluations at intervals specified in the plan, but in no case less than once a year. Such evaluations shall provide:

a) Areas contributing to a storm water discharge associated with coal mining-related areas shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. These areas include haul and access roads; railroad spurs, sidings, and internal haulage lines; conveyor belts, chutes and aerial tramways; equipment storage and maintenance yards; coal handling buildings and structures; and inactive mines and related areas. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures, as indicated in paragraphs 3.a.(3)(h) and 3.a.(3)(i) above and where identified in the plan, shall be observed to ensure that they are operating correctly. A visual evaluation of any equipment needed to implement the plan, such as spill response equipment, shall be made.

b) Based on the results of the evaluation, the description of potential pollutant sources identified in the plan, in accordance with paragraph 3.a.(2) of this section, and pollution prevention measures and controls identified in the plan, in accordance with paragraph 3.a.(3) of this

section, shall be revised as appropriate within 2 weeks of such evaluation and shall provide for implementation of any changes to the plan in a timely manner. For inactive mines, such revisions may be extended to a maximum of 12 weeks after the evaluation.

c) A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph 3.a.(4)(b) above shall be made and retained as part of the storm water pollution prevention plan for at least 3 years after the date of the evaluation. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with Part IV.G.4. (Signatory Requirements) of this permit.

d) Where compliance evaluation schedules overlap with inspections required under 3.a.(3)(d), the compliance evaluation may be conducted in place of one such inspection. Where annual site compliance evaluations are shown in the plan to be impractical for inactive mining sites due to the remote location and inaccessibility of the site, site inspections required under this part shall be conducted at appropriate intervals specified in the plan, but, in no case less than once in 3 years.

4. Numeric Effluent Limitations. There are no additional numeric effluent limitations beyond those described in Part I.E. of this permit.

5. Monitoring and Reporting Requirements.

a. Benchmark Analytical Monitoring Requirements. Dugout Mine must monitor their storm water discharges associated with industrial activity at least quarterly (4 times per year) during years 2 and 4 of the permit cycle except as provided in paragraphs 5.a.(3) (Sampling Waiver), 5.a.(4) (Representative Discharge), and 5.a.(5) (Alternative Certification). Dugout Mine is required to monitor their storm water discharges for the pollutants of concern listed in Table E. below. Reports must be made in accordance with 5.b. (Reporting). In addition to the parameters listed in Table E. below, Dugout Mine must provide the date and duration (in hours) of the storm event(s) sampled; rainfall measurements or estimates (in inches) of the storm event that generated the sampled runoff; the

duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and an estimate of the total volume (in gallons) of the discharge sampled.

The results of benchmark monitoring are primarily for Dugout Mine's use to determine the overall effectiveness of the SWPPP in controlling the discharge of pollutants to receiving waters. Benchmark values are not viewed as permit limitations. An exceedance of a benchmark value does not, in and of itself, constitute a violation of this permit. While exceedance of a benchmark value does not automatically indicate a violation of a water quality standard has occurred, it does signal that modifications to the SWPPP or more specific pollution prevention controls may be necessary.

Table E.
Monitoring Requirements for Coal Mining Facilities

Pollutants of Concern	Cut-Off Concentration
Total Recoverable Aluminum	0.75 mg/L
Total Recoverable Iron	1.0 mg/L
Total Suspended Solids	100 mg/L

1) Monitoring Periods. Dugout Mine shall monitor samples collected during the sampling periods of: January through March, April through June, July through September, and October through December during the second and fourth years of this permit cycle.

2) Sample Type. A minimum of one grab sample shall be taken. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. The required 72-hour storm event interval is waived where the preceding measurable storm event did not result in a measurable discharge from the facility. The required 72-hour storm event interval may also be waived where Dugout Mine documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted. The grab sample shall be taken during the first 30 minutes of the discharge. If the collection of a grab sample during the first 30 minutes is impracticable, a grab sample can be taken during the first hour of the discharge, and the discharger shall submit with the monitoring report a description of why a grab sample during the first 30 minutes was impracticable. If storm water discharges associated with industrial activity commingle with process or nonprocess water, then where practicable permittees must attempt to sample the storm water discharge before it mixes with the non-storm water discharge.

3) Sampling Waiver.

a) Adverse Conditions. If Dugout Mine is unable to collect samples within a specified sampling period due to adverse climatic conditions, thus a substitute sample shall be collected from a separate qualifying event in the next monitoring period and the data submitted along with the data for the routine sample in that period. Adverse weather conditions that may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricanes, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

b) Low Concentration Waiver. When the average concentration for a pollutant calculated from all monitoring data collected from an outfall during the second year monitoring is less than the corresponding value for that pollutant listed in Table E. under the column Monitoring Cut-Off Concentration, Dugout Mine may waive monitoring and reporting requirements for the fourth year monitoring period. Dugout Mine must submit to the Executive Secretary, in lieu of the monitoring data, a certification that there has not been a significant change in industrial activity or the pollution prevention measures in area of the facility that drains to the outfall for which sampling was waived.

c) Inactive and Unstaffed Site. If Dugout Mine is unable to conduct quarterly chemical storm water sampling at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirements as long as the facility remains inactive and unstaffed. Dugout Mine must submit to the Executive Secretary, in lieu of monitoring data, a certification statement on the Storm Water Discharge Monitoring Report (SWDMR) stating that the site is inactive and unstaffed so that collecting a sample during a qualifying event is not possible.

4) Representative Discharge. If the facility has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, discharge substantially identical effluents, Dugout Mine may test the effluent of one of such outfalls and report that the quantitative data also applies to the

substantially identical outfall(s) provided that Dugout Mine includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that Dugout Mine believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area [e.g., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)] shall be provided in the plan. Dugout Mine shall include the description of the location of the outfalls, explanation of why outfalls are expected to discharge substantially identical effluents, and estimate of the size of the drainage area and runoff coefficient with the SWDMR.

5) Alternative Certification. Dugout Mine is not subject to the monitoring requirements of this section provided that certification is made for a given outfall or on a pollutant-by-pollutant basis in lieu of monitoring reports required under paragraph b. below, under penalty of law, signed in accordance with Part IV.G.4. (Signatory Requirements). The Certification shall state that material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, industrial machinery or operations, or significant materials from past industrial activity that are located in areas of the facility within the drainage area of the outfall are not presently exposed to storm water and are not expected to be exposed to storm water for the certification period. Such certification must be retained in the storm water pollution prevention plan, and submitted to DWQ in accordance with Part II.D. of this permit. In the case of certifying that a pollutant is not present, Dugout Mine must submit the certification along with the monitoring reports required under paragraph b. below. If Dugout Miner cannot certify for an entire period, they must submit the date exposure was eliminated and any monitoring required up until that date. This certification option is not applicable to compliance monitoring requirements associated with effluent limitations.

b. Reporting. Dugout Mine shall submit monitoring results for each outfall associated with industrial activity [or a certification in accordance with Sections (3), (4), or (5) above] obtained during the second year reporting period, on Storm Water Discharge Monitoring Report (SWDMR) form(s) postmarked no later than the 31st day of the following March. Monitoring results [or a certification in accordance with Sections (3), (4), or (5) above] obtained during the fourth year reporting period shall be submitted on SWDMR form(s) postmarked no later than the 31st day of the following March. For each outfall, one signed SWDMR form must be submitted to the Executive Secretary per storm event sampled. Signed

copies of SWDMRs, or said certifications, shall be submitted to the Executive Secretary at the address listed in Part II.D. of the permit.

c. Visual Examination of Storm Water Quality. Dugout shall perform and document a visual examination of a representative storm water discharge at the following frequencies: quarterly for active areas under SMCRA bond located in areas with average annual precipitation over 20 inches; semi-annually for inactive areas under SMCRA bond, and active areas under SMCRA bond located in areas with average annual precipitation of 20 inches or less; visual examinations are not required at inactive areas not under SMCRA bond.

1) Visual Monitoring Periods. Examinations shall be conducted in each of the following periods for the purposes of visually inspecting storm water runoff or snow melt: Quarterly-January through March; April through June; July through September; and October through December. Semi-annually—January through June and July through December.

2) Sample and Data Collection. Examinations shall be made of samples collected within the first 60 minutes (or as soon thereafter as practical, but not to exceed two hours) of when the runoff or snowmelt begins discharging. The examinations shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution. The examination must be conducted in a well-lit area. No analytical tests are required to be performed on the samples. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where practicable, the same individual will carry out the collection and examination of discharges for the life of the permit.

3) Visual Storm Water Discharge Examination Reports. Visual examination reports must be maintained onsite in the pollution prevention plan. The report shall include the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution), and probable sources of any observed storm water contamination.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling Samples taken in compliance with the monitoring requirements established under *Part I* shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Sludge samples shall be collected at a location representative of the quality of sludge immediately prior to the use-disposal practice.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under *Utah Administrative Code ("UAC") R317-2-10*, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The *Act* provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results. Monitoring results obtained during the previous month shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), post-marked no later than the 28th day of the month following the completed reporting period. The first report is due on December 28, 2004. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports including whole effluent toxicity (WET) test reports required herein, shall be signed and certified in accordance with the requirements of *Signatory Requirements (see Part IV.G)*, and submitted to the Director, Division of Water Quality at the following address:

original to: Department of Environmental Quality
Division of Water Quality
288 North 1460 West
PO Box 144870
Salt Lake City, Utah 84114-4870

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any parameter more frequently than required by this permit, using test procedures approved under *UAC R317-2-10* or as otherwise specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated. Only those parameters required by the permit need to be reported.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) and time(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and,
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time. A copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall (orally) report any noncompliance which may seriously endanger health or environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of circumstances. The report shall be made to the Division of Water Quality, (801) 538-6146, or 24 hour answering service (801) 536-4123.

2. The following occurrences of noncompliance shall be reported by telephone (801) 536-4123 as soon as possible but no later than 24 hours from the time the permittee becomes aware of the circumstances:

   a. Any noncompliance which may endanger health or the environment;

   b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See *Part III.G, Bypass of Treatment Facilities.*);

   c. Any upset which exceeds any effluent limitation in the permit (See *Part III.H, Upset Conditions.*); or,

   d. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

e. Steps taken, if any, to mitigate the adverse impacts on the environment and human health during the noncompliance period.

4. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, (801) 538-6146.

5. Reports shall be submitted to the addresses in *Part II.D, Reporting of Monitoring Results.*

J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part II.D* are submitted. The reports shall contain the information listed in *Part II.I.3.*

K. Inspection and Entry. The permittee shall allow the Executive Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the *Act*, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The *Act* provides that any person who violates a permit condition implementing provisions of the *Act* is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions of the Act is subject to a fine not exceeding $25,000 per day of violation; Any person convicted under *UCA 19-5-115(2)* a second time shall be punished by a fine not exceeding $50,000 per day. Except as provided at *Part III.G, Bypass of Treatment Facilities* and *Part III.H, Upset Conditions*, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances. Collected screening, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash shall not directly enter either the final effluent or waters of the state by any other direct route.

G. Bypass of Treatment Facilities.

1. Bypass Not Exceeding Limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation.

These bypasses are not subject to 2. and 3. of this section.

2. Prohibition of Bypass.

a. Bypass is prohibited, and the Executive Secretary may taken enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of human life, personal injury, or severe property damage;

(2) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance, and

(3) The permittee submitted notices as required under section G.3.

b. The executive Secretary may approve an anticipated bypass, after considering its adverse effects, if the Executive Secretary determines that it will meet the three conditions listed in sections G.2a. (1), (2) and (3).

3. Notice.

a. Anticipated bypass. Except as provided above in section G.2. and below in section G. 3.b, if the permittee knows in advance of the need for a bypass, it shall submit prior notice, at least ninety days before the date of bypass. The prior notice shall include the following unless otherwise waived by the Executive Secretary:

(1) Evaluation of alternative to bypass, including cost-benefit analysis containing an assessment of anticipated resource damages:

(2) A specific bypass plan describing the work to be performed including scheduled dates and times. The permittee must notify the Executive Secretary in advance of any changes to the bypass schedule;

(3) Description of specific measures to be taken to minimize environmental and public health impacts;

(4) A notification plan sufficient to alert all downstream users, the public and others reasonably expected to be impacted by the bypass;

(5) A water quality assessment plan to include sufficient monitoring of the receiving water before, during and following the bypass to enable evaluation of public health risks and environmental impacts; and

(6) Any additional information requested by the Executive Secretary.

b. Emergency Bypass. Where ninety days advance notice is not possible, the permittee must notify the Executive Secretary, and the Director of the Department of Natural Resources, as soon as it becomes aware of the need to bypass and provide to the Executive Secretary the information in section G.3.a.(1) through (6i) to the extent practicable.

c. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass to the Executive Secretary as required under Part II.I., Twenty Four Hour Reporting. The permittee shall also immediately notify the Director of the Department of Natural Resources, the public and downstream users and shall implement measures to minimize impacts to public health and environment to the extent practicable.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2. of this section are met. Executive Secretary's administrative determination regarding a claim of upset cannot be judiciously challenged by the permittee until such time as an action is initiated for noncompliance.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the permittee can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The permittee submitted notice of the upset as required under Part II.I, Twenty-four Hour Notice of Noncompliance Reporting; and,

d. The permittee complied with any remedial measures required under Part III.D, Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of *The Water Quality Act of 1987* for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Executive Secretary as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/L);

   b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

   c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(7)* or (10); or,

   d. The level established by the Executive Secretary in accordance with *UAC R317-8-4.2(6)*.

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/L);

   b. One milligram per liter (1 mg/L) for antimony:

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(9)*; or,

   d. The level established by the Executive Secretary in accordance with *UAC R317-8-4.2(6)*.

K. Industrial Pretreatment. Any wastewaters discharged to the sanitary sewer, either as a direct discharge or as a hauled waste, are subject to Federal, State and local pretreatment regulations. Pursuant to Section 307 of *The Water Quality Act of*

1987, the permittee shall comply with all applicable federal General Pretreatment Regulations promulgated at *40 CFR 403*, the State Pretreatment Requirements at *UAC R317-8-8*, and any specific local discharge limitations developed by the Publicly Owned Treatment Works (POTW) accepting the wastewaters.

In addition, in accordance with *40 CFR 403.12(p)(1)*, the permittee must notify the POTW, the EPA Regional Waste Management Director, and the State hazardous waste authorities, in writing, if they discharge any substance into a POTW which if otherwise disposed of would be considered a hazardous waste under *40 CFR 261*. This notification must include the name of the hazardous waste, the EPA hazardous waste number, and the type of discharge (continuous or batch).

IV. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit. In addition, if there are any planned substantial changes to the permittee's existing sludge facilities or their manner of operation or to current sludge management practices of storage and disposal, the permittee shall give notice to the Executive Secretary of any planned changes at least 30 days prior to their implementation.

B. Anticipated Noncompliance. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall apply for and obtain a new permit. The application shall be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official

2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2 must be submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The *Act* provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000.00 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under *UAC R317-8-3.2*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of Executive Secretary. As required by the *Act*, permit applications, permits and effluent data shall not be considered confidential

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the permittee of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the *Act*.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any

invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Executive Secretary at least 20 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by *UCA 19-5-117.*

O. Water Quality-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. A revision to the current Water Quality Management Plan is approved and adopted which calls for different effluent limitations than contained in this permit.

P. Toxicity Limitation-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include whole effluent toxicity (WET) testing, a WET limitation, a compliance schedule, a compliance date, additional or modified numerical limitations, or any other conditions related to the control of toxicants if toxicity is detected during the life of this permit.

APPENDIX 7-7

Surface-Water Monitoring Data

ADD TO THE BACK OF EXISTING INFORMATION

"FAN" Monitoring Data 2003 - 2004

Date	Time	pH	Cond.	Temp.	DO	Flow (gpm)	Comments
11/21/03	1615					NOF	Dry
3/29/04	1020					NOF	Frozen
6/16/04	1130	9.49	1010	14	6.5	20	
8/17/04	830	8.64	744	11	4.5	20	
10/12/04	1300	8.62	1008	7	5	14	

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487(800) 334-5493

Inorganic Analytical Results

Soldier Creek Coal Company
Project ID:
Sample ID: FAN

ACZ Sample ID: ***L46311-03***
Date Sampled: *06/16/04 11:30*
Date Received: *06/21/04*
Sample Matrix: *Surface Water*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	52.7			mg/L	0.2	1	06/21/04 21:05	wfg
Iron, dissolved	M200.7 ICP	0.03	B		mg/L	0.01	0.05	06/21/04 21:05	wfg
Iron, total	M200.7 ICP	0.68			mg/L	0.01	0.05	06/26/04 10:11	scp
Magnesium, dissolved	M200.7 ICP	68.2			mg/L	0.2	1	06/21/04 21:05	wfg
Manganese, dissolved	M200.7 ICP		U		mg/L	0.005	0.03	06/21/04 21:05	wfg
Manganese, total	M200.7 ICP	0.014	B		mg/L	0.005	0.03	06/24/04 21:32	scp
Potassium, dissolved	M200.7 ICP	3.4			mg/L	0.3	1	06/21/04 21:05	wfg
Sodium, dissolved	M200.7 ICP	54.6			mg/L	0.3	1	06/21/04 21:05	wfg

Metals Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							06/24/04 9:40	scp

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration								
Bicarbonate as CaCO3		334			mg/L	2	10	06/22/04 0:00	mah
Carbonate as CaCO3			U		mg/L	2	10	06/22/04 0:00	mah
Hydroxide as CaCO3			U		mg/L	2	10	06/22/04 0:00	mah
Total Alkalinity		334			mg/L	2	10	06/22/04 0:00	mah
Cation-Anion Balance	Calculation								
Cation-Anion Balance		-2.7			%			07/08/04 0:00	calc
Sum of Anions		11.3			meq/L	0.1	0.5	07/08/04 0:00	calc
Sum of Cations		10.7			meq/L	0.1	0.5	07/08/04 0:00	calc
Chloride	M325.2 - Colorimetric	8			mg/L	1	5	07/02/04 20:03	kmc
Lab Filtration	SM 3030 B							06/22/04 8:06	las
Oil & Grease, Total Recoverable	M1664 - Gravimetric		U	*	mg/L	2	10	06/30/04 4:48	mah
Residue, Filterable (TDS) @180C	M160.1 - Gravimetric	590			mg/L	10	20	06/23/04 17:23	bf
Residue, Non-Filterable (TSS) @105C	M160.2 - Gravimetric	32			mg/L	5	20	06/22/04 14:21	mah
Sulfate	M375.3 - Gravimetric	210			mg/L	10	50	06/28/04 9:19	djb
TDS (calculated)	Calculation	597			mg/L	10	50	07/08/04 0:00	calc
TDS (ratio - measured/calculated)	Calculation	0.99						07/08/04 0:00	calc

** Please refer to Extended Qualifier Report for detail.*

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487(800) 334-5493

Inorganic Analytical Results

Soldier Creek Coal Company
Project ID:
Sample ID: FAN

ACZ Sample ID: ***L47295-06***
Date Sampled: *08/17/04 08:30*
Date Received: *08/19/04*
Sample Matrix: *Surface Water*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	64.1			mg/L	0.2	1	08/25/04 2:01	wfg
Iron, dissolved	M200.7 ICP		U		mg/L	0.01	0.05	08/24/04 5:34	wfg
Iron, total	M200.7 ICP	3.40		*	mg/L	0.01	0.05	09/01/04 10:45	wfg
Magnesium, dissolved	M200.7 ICP	50.2			mg/L	0.2	1	08/25/04 2:01	wfg
Manganese, dissolved	M200.7 ICP	0.016	B		mg/L	0.005	0.03	08/25/04 2:01	wfg
Manganese, total	M200.7 ICP	0.079			mg/L	0.005	0.03	09/01/04 10:45	wfg
Potassium, dissolved	M200.7 ICP	4.5			mg/L	0.3	1	08/24/04 5:34	wfg
Sodium, dissolved	M200.7 ICP	42.8			mg/L	0.3	1	08/24/04 5:34	wfg

Metals Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							08/31/04 7:51	wfg

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration								
Bicarbonate as CaCO3		279			mg/L	2	10	08/30/04 0:00	mah
Carbonate as CaCO3			U		mg/L	2	10	08/30/04 0:00	mah
Hydroxide as CaCO3			U		mg/L	2	10	08/30/04 0:00	mah
Total Alkalinity		279			mg/L	2	10	08/30/04 0:00	mah
Cation-Anion Balance	Calculation								
Cation-Anion Balance		1.1			%			09/10/04 0:00	calc
Sum of Anions		9.1			meq/L	0.1	0.5	09/10/04 0:00	calc
Sum of Cations		9.3			meq/L	0.1	0.5	09/10/04 0:00	calc
Chloride	M325.2 - Colorimetric	6		*	mg/L	1	5	08/26/04 21:20	jjr
Lab Filtration	SM 3030 B							08/24/04 11:24	ak
Oil & Grease, Total Recoverable	M1664 - Gravimetric		U		mg/L	2	10	08/28/04 9:25	mah
Residue, Filterable (TDS) @180C	M160.1 - Gravimetric	490	H	*	mg/L	10	20	08/30/04 12:40	jah
Residue, Non-Filterable (TSS) @105C	M160.2 - Gravimetric	78			mg/L	5	20	08/24/04 18:26	ct
Sulfate	M375.3 - Gravimetric	160			mg/L	10	50	09/02/04 8:26	jah
TDS (calculated)	Calculation	495			mg/L	10	50	09/10/04 0:00	calc
TDS (ratio - measured/calculated)	Calculation	0.99						09/10/04 0:00	calc

** Please refer to Extended Qualifier Report for detail.*

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487(800) 334-5493

Inorganic Analytical Results

Soldier Creek Coal Company
Project ID:
Sample ID: FAN

ACZ Sample ID: ***L48311-01***
Date Sampled: *10/12/04 13:00*
Date Received: *10/15/04*
Sample Matrix: *Surface Water*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Calcium, dissolved	M200.7 ICP	75.7			mg/L	0.2	1	10/28/04 21:09	wfg/ak
Iron, dissolved	M200.7 ICP	0.03	B		mg/L	0.01	0.05	10/28/04 21:09	wfg/ak
Iron, total	M200.7 ICP	0.12			mg/L	0.01	0.05	10/28/04 21:04	wfg
Magnesium, dissolved	M200.7 ICP	69.3			mg/L	0.2	1	10/28/04 21:09	wfg/ak
Manganese, dissolved	M200.7 ICP	0.078			mg/L	0.005	0.03	10/28/04 21:09	wfg/ak
Manganese, total	M200.7 ICP	0.082			mg/L	0.005	0.03	10/28/04 21:04	wfg
Potassium, dissolved	M200.7 ICP	4.1			mg/L	0.3	1	10/28/04 21:09	wfg/ak
Sodium, dissolved	M200.7 ICP	52.1			mg/L	0.3	1	10/28/04 21:09	wfg/ak

Metals Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							10/25/04 14:33	ak

Wet Chemistry

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration								
Bicarbonate as CaCO3		353			mg/L	2	10	10/26/04 0:00	mah
Carbonate as CaCO3		13			mg/L	2	10	10/26/04 0:00	mah
Hydroxide as CaCO3			U		mg/L	2	10	10/26/04 0:00	mah
Total Alkalinity		366			mg/L	2	10	10/26/04 0:00	mah
Cation-Anion Balance	Calculation								
Cation-Anion Balance		-0.4			%			11/09/04 0:00	calc
Sum of Anions		12.0			meq/L	0.1	0.5	11/09/04 0:00	calc
Sum of Cations		11.9			meq/L	0.1	0.5	11/09/04 0:00	calc
Chloride	M325.2 - Colorimetric	9			mg/L	1	5	10/28/04 10:00	ccp/pb
Lab Filtration	SM 3030 B							10/19/04 17:56	gac
Oil & Grease, Total Recoverable	M1664 - Gravimetric		U	*	mg/L	2	10	10/29/04 4:57	mah
Residue, Filterable (TDS) @180C	M160.1 - Gravimetric	660	H	*	mg/L	10	20	10/29/04 16:48	jah
Residue, Non-Filterable (TSS) @105C	M160.2 - Gravimetric		UH	*	mg/L	5	20	11/03/04 11:21	ktd
Sulfate	M375.3 - Gravimetric	210			mg/L	10	50	10/28/04 15:49	ktd
TDS (calculated)	Calculation	645			mg/L	10	50	11/09/04 0:00	calc
TDS (ratio - measured/calculated)	Calculation	1.02						11/09/04 0:00	calc

** Please refer to Extended Qualifier Report for detail.*

APPENDIX 7-12

Pace Canyon Fan Portal Site

APPENDIX 7-12

Pace Canyon Fan Portal Site

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710 INTRODUCTION

This appendix gives details regarding the drainage and sediment controls proposed for the Pace Canyon Fan Portal Site. Sections of Chapter 7 of the M&RP that would require significant revisions or additions related to the Pace Canyon Fan Portal Site have been recreated in this appendix to minimize confusion between the Dugout Canyon Site and the Pace Canyon Fan Portal Site. To aid in review the same numbering system used in Chapter 7 has been used in this appendix. Chapter 7 of the M&RP should be referred to for any sections not included in this appendix.

732 Sediment Control Measures

The sediment control measures for the Pace Canyon Fan Portal Area have been designed to prevent additional contributions of sediment to streamflow or to runoff outside the permit area. In addition, they have been designed to meet applicable effluent limitations, and minimize erosion to the extent possible.

The structures to be used for the runoff-control plan for the area include disturbed and undisturbed area diversion channels, a sediment trap, containment berms, silt fences, and road diversions and culverts.

732.100 Siltation Structures

The siltation structure within the disturbed area will be a sediment trap as described in Section 732.200.

732.200 Sedimentation Ponds

There will be no sediment pond at the fan portal site, instead there is a single sediment trap located at the southwest end of the disturbed area. The sediment trap topography and cross sections are presented on Plate PC 7-4. Details regarding the sediment trap design are presented in this appendix.

Sediment accumulation will be removed periodically as needed. A large sediment load to this sediment trap is not anticipated since Alternate Sediment Control Measures ("ASCM") are being used at the site. Alternate sediment control calculations are included in this appendix that

demonstrate that the sediment yield from the site will be less than before the site was built without a sediment trap. Thus, the sediment trap is not expected to accumulate a large volume of sediment. The sediment will be disposed of at the approved waste rock disposal sites as described in Chapter 5, Section 520 of this M&RP.

The sediment trap is within the disturbed area boundary and is subject to final reclamation. The area is included in the calculation of the disturbed area subject to bonding and in the calculation of final reclamation costs.

Compliance Requirements. The sediment trap will be maintained until removal in accordance with the reclamation plan (see Section 540 of this M&RP). When the pond is removed, the land will be revegetated in accordance with the reclamation plan defined in Section 540.

The sediment trap was designed to contain approximately 60% of the runoff from the 10-year, 24-hour storm event. The spillway for the sediment trap will easily pass the peak flow resulting from the 25-year, 6-hour precipitation event.

MSHA Requirements. MSHA requirements defined in 30 CFR 77.216 are not applicable since the sediment trap will not impound water or sediment to an elevation of 20 feet or more above the upstream toe of the structure. The trap will also store a volume less than 20 acre-feet.

732.300 Diversions

The objective of the runoff control plan is to isolate, to the maximum degree possible, runoff from disturbed areas from that of undisturbed areas. This is accomplished by:

- Building all facilities at least 30 feet from Pace Creek;
- Routing runoff from the adjacent undisturbed areas above the facilities through culverts and diversion ditches where feasible to bypass the disturbed area; and
- Routing any runoff from undisturbed areas which enters the disturbed area into the sediment control system.

The location of each diversion ditch or culvert for the site is presented on Plate PC7-5. Details regarding design of the diversions are presented in this appendix. A brief list of the proposed diversion structures follows (refer to Plates PC7-5 and PC7-6 for the location of each watershed boundary):

Diversion Ditches:

- Interception ditch PCUD-1 above the generators and fan structure will collect runoff from adjacent undisturbed watersheds and direct the runoff into a tributary of Pace Creek.

- Undisturbed drainage ditch PCUD-2 will re-establish a historic channel blocked by a rock fall. The rock fall caused a second channel to form, which does not connect to the existing channel below the existing road. The re-established ditch channel will permanently move the drainage away from the site facilities and will connect with the existing channel below the road. The ditch will remain in place after reclamation.

- Disturbed drainage ditch PCD-1 will be located upstream from the sediment trap. The majority of runoff from the site will reach the sediment trap by sheet flow. This ditch will collect the sheet flow and safely convey the runoff into the sediment trap.

Diversion Culverts:

- Culverts PCUC-1, 2 and 3 will all divert undisturbed runoff around the disturbed area.

- Culvert PCDC-1 will convey runoff in excess of the sediment trap's capacity to a tributary of Pace Creek. This culvert is the sediment trap's spillway.

All diversion ditches will be maintained with adequate riprap or alternative erosion protection in the ditch sections where flow velocities are predicted to be sufficiently high to require a ditch lining. Adequate ditch capacities will be maintained in all ditch sections. Culverts will be kept free of debris and each outlet will be protected with riprap where deemed necessary. Detailed diversion designs are presented in Attachment 1 of this appendix.

732.400 Road Drainage

Road drainage facilities will include a water bar to divert road runoff into the adjacent drainage just above the site and two culverts to divert runoff from undisturbed drainages under the road. After site construction has been completed the interim sediment control will be removed (Section 731.100 in M&RP)and the road drainage from the realigned BLM road will be treated the same as the rest of the road. A berm will prevent any runoff from the fan portal site from mixing with the road drainage.

Road drainage diversions and culverts will be maintained and repaired, as needed, following major storm events.

733 Impoundments

733.100 General Plans

There will be a single sediment trap operating at the site as described in Section 732.200. The sediment trap topography and cross sections are presented on Plate PC 7-4 and design information is presented in Attachment 1 of this appendix.

Certification. All maps and cross sections of the sedimentation trap have been prepared by or under the direction of, and certified by a qualified, registered, professional engineer.

Maps and Cross Sections. The topography and cross sections for the sediment trap are provided on Plate PC7-4.

Narrative. A description of the sediment trap is presented in Sections 732.200 and 742 of this appendix.

Subsidence Survey Results. No underground coal mining will occur beneath the proposed sediment trap. Therefore, there will be no effects on the sediment trap from subsidence.

Hydrologic Impact. The hydrologic and geologic information required to assess the hydrologic impacts of the proposed sediment trap are presented in Section 724 and Chapter 6 of this M&RP, respectively.

Design Plans and Construction Schedule. There are no additional structures proposed for the mining operation at this time. Any structures proposed in the future will not be constructed until the Division has approved the detailed design plan for the structure.

733.200 Permanent and Temporary Impoundments

Requirements. The sediment trap has been designed using current, prudent engineering practices.

Permanent Impoundments. There are no permanent impoundment structures proposed for use in mining and reclamation operations within the disturbed and adjacent areas.

Temporary Impoundments. The Division's authorization is being sought for the construction of the sediment trap as a temporary impoundment at the fan portal site as part of coal mining and reclamation operations.

Hazard Notifications. The sediment trap will be examined for structural weakness and erosion and if a potential hazard to the public exists the Division will be promptly informed. A plan will be formulated to mitigate the hazard associated with the sediment trap.

740 DESIGN CRITERIA AND PLANS

741 General Requirements

This appendix includes site-specific plans that incorporate minimum design criteria for the control of drainage from disturbed and undisturbed areas associated with the Pace Canyon Fan Portal Site.

742 Sediment Control Measures

742.100 General Requirements

Design. Sediment-control measures have been designed to provide the following:

- Prevent additional contributions of sediment to stream flow or to runoff outside the permit area;
- Meet the effluent limitations defined in Section 751; and
- Minimize erosion to the extent possible.

Measures and Methods. The sediment control measures at the site will include practices carried out within and adjacent to the disturbed area. Sediment control methods will include:

- Retention of sediment within the disturbed area;
- Diversion of runoff away from the disturbed area;
- Diversion of runoff using channels or culverts through disturbed areas to prevent additional erosion;
- Provision of silt fences, riprap, contemporaneous revegetation, vegetative sediment filters, a sediment trap, and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment; and
- Treatment of mine drainage in underground sumps.

742.200 Siltation Structures

General Requirements. Additional contributions of suspended solids and sediment to stream flow or runoff outside the permit area will be prevented to the extent possible using alternate sediment control measures and a sediment trap. The sediment trap will be constructed as soon as practical

when construction commences. The structures will be certified by a qualified registered professional engineer.

The sediment trap has been designed and will be constructed and maintained as described in Chapter 5 and Sections 733 and 743.

The sediment trap is part of an alternate sediment control system at the site. Due to the small size of the site a sedimentation pond is not reasonable. Thus alternate sediment control is being used. A combination of sediment control methods will be used. As shown on Plate PC7-5A three types of alternate sediment control will be used in addition to the sediment trap. In areas that will not be disturbed after construction and which have 2:1 slope or flatter the area will be deep gouged mulched and hydroseeded. These areas include the topsoil stockpile and its angle of repose slopes even though there will also be a full containment berm around the stockpile. This is the same sediment control method that has been used during final reclamation of many sites with great success. The areas that may be disturbed during operation, such as the sediment trap area, and areas of very steep slopes will be mulched and hydroseeded. Finally, the operational areas and areas prevented from being vegetated by MSHA requirements will be covered by gravel or riprap. The gravel used will be washed 2 inch minus gravel. In Attachment 2 of this appendix alternate sediment control calculations have been made to demonstrate that the above three methods reduce the operational sediment yield of the site to less than the pre-mining sediment yield. Thus, the alternate sediment control measures sufficiently control sediment yield without the use of a sedimentation pond. The proposed sediment trap will provide additional sediment control.

Sediment ponds. A single sediment trap has been designed for the site. The sediment trap will be located in the southwest corner of the disturbed area.

Design, Construction, and Maintenance

Sediment Storage Volume. The sediment trap has been designed to control sediment from disturbed and undisturbed areas. The disturbed area contributing runoff to the sediment trap contains 1.93 acres from watershed PCWS-1 (portions of which will be undisturbed or contemporaneously reclaimed). As discussed previously the sediment trap will be installed in addition to alternate sediment control measures. The sediment load of the runoff flowing into the sediment trap will be less than if an equal amount of runoff from an undisturbed area flowed into the sediment trap. Thus, sediment is expected to accumulate slowly. Since this is not a

sedimentation pond there is not a maximum specified sediment storage volume. However, sediment will be removed when accumulated sediment fills up approximately half of the sediment trap's capacity.

Detention Time. The combination of the alternate sediment control measures and sediment trap should allow any effluent to meet UPDES and 40 CFR Part 434 limitations.

Design Event. The designed sediment trap can contain about 40% of the runoff resulting from the 10-year, 24-hour precipitation event before runoff flows out the spillway. The sediment trap can hold the entire 10-year, 24-hour precipitation event if the spillway is plugged.

Sediment Trap Description. Watershed PCWS-1 defines the area that flows to the sediment trap. This watershed includes both disturbed and undisturbed areas.

The curve numbers used to determine the runoff volumes were based on information presented in Attachment 1 of this appendix. The area weighted average curve number for PCWS-1 was estimated to be 83. Refer to Table 7-1 for a list of all disturbed and undisturbed watershed areas.

The storm runoff volume to the sediment trap resulting from the 10-year, 24-hour storm event was calculated to be 4624 cubic feet (0.11 acre-feet). The calculations, presented in Attachment 1 are based on hydrologic design methods described in Appendix 7-10. As presented above, the maximum sediment storage volume is approximately half of the sediment trap capacity or about 1000 cubic feet).

The spillway on the sediment trap will be set at an elevation of 6991.0. The spillway will be an eighteen inch CMP. As calculations in Attachment 1 demonstrate, this spillway can easily pass the runoff from a 25-year 6-hour storm event.

From the final analysis of the 25-year, 6-hour storm event, the maximum inflow rate to the sediment trap from storm runoff under design conditions was calculated to be 0.88 cubic feet per second (cfs). Although the sediment trap will reduce the peak outflow the same flow of 0.88 cfs was used to design the spillway. The spillway has a maximum capacity of 5.5 cfs without generating a headwater. The top of the sediment trap embankment will be at least 3 feet above the inlet elevation for the spillway. Therefore, the trap has been designed with adequate freeboard. The spillway outlet will be protected by the placement of D_{50} = 6 inch riprap (minimum).

TABLE 7-1
SUMMARY OF WATERSHED DATA

Watershed[a]	Curve Number	Area (acres)	Time of Concentration (hours)
PCWS-1	83	1.93	0.053
PCWS-2	80	2.99	0.043
PCWS-3	80	39.78	0.126
PCWS-4	80	149.30	0.235

(a) See Plates PC7-5, and 7-6 for watershed boundaries

TABLE 7-2
STAGE-CAPACITY CURVE FOR THE SEDIMENT TRAP

ELEVATION (FT)	AREA (FT^2)	INCREMENTAL VOLUME (FT^3)	CUMULATIVE VOLUME (FT^3)
6,986	55.5		0
		347.3	
6,988	291.8		347.3
		933.3	
6,990	641.5		1280.6
		1740.3	
6,992	1098.8		3020.9
		2909.3	
6,994	1810.5		5930.2

Dewatering Device. The primary spillway will be the only outlet for stormwater in the sediment trap. Water will be discharged from the pond in accordance with UPDES guidelines.

Short Circuiting. Short circuiting may occur if the storage capacity of the sediment trap is exceeded. However, the alternate sediment control measures will adequately control the sediment yield from the site. The sediment trap will still provide sediment control beyond what is required.

Sediment Removal. Sediment removal from the sediment trap will occur when the sediment level reaches approximately 50% of the sediment trap's storage capacity. This corresponds to an approximate elevation of 6989.5 or 1.5 feet below the spillway inlet elevation. The sediment removed from the sediment trap will be transported and disposed of as discussed in Chapter 5, and Chapter 7, Section 732.200 of this M&RP. Water that meets the quality standards set forth in the UPDES permit will be discharged to Pace Creek before sediment cleanout begins. Water not meeting the standards will be used for dust suppression within the disturbed area or on mine roadways.

Excessive Settlement. The majority of the sediment trap is to be excavated from native undisturbed material or from under the existing road, thereby making settlement highly unlikely. Less than 4 feet of the embankment will be constructed. The portion of the embankment to be constructed will be constructed in a manner to minimize settlement.

Embankment Material. During construction of the sediment trap, any material to be used in the embankment will be inspected to ensure the material is free of sod, large roots, frozen soil, and acid- or toxic forming coal-processing waste.

Compaction. The sediment trap will be primarily excavated out of native undisturbed ground, thereby eliminating the need for additional compaction. Any portion of the embankment constructed will be compacted to a minimum dry density of 90 % as determined by ASTM D1557.

MSHA Sediment Ponds. MSHA requirements defined in 30 CFR 77.216 are not applicable at this site. Refer to Section 732.200.

Other Treatment Facilities. There are no other treatment facilities within the mine permit area.

Exemptions. No exemptions are being proposed at this time.

742.300 Diversions

General Requirements. The diversions within the permit area will consist of drainage ditches and culverts. All diversions within the permit area have been designed to minimize adverse impacts to the hydrologic balance, to prevent material damage outside the permit area, and to assure the safety of the public.

All diversions and diversion structures have been designed and will be constructed, and maintained and used to:

Be stable;

Provide protection against flooding and resultant damage to life and property;

Prevent, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area; and

Comply with all applicable local, state, and federal laws and regulations.

All diversions within the disturbed area will be removed when no longer needed. The diversions will be reclaimed in accordance with the reclamation plan defined in Chapter 5.

Peak discharge rates from the undisturbed and disturbed area drainages within the area were calculated for use in designing diversion ditches and culverts. The storm runoff calculations for the temporary diversion structures were based on the 10-year, 6-hour precipitation event of 1.35 inches.

Curve numbers were based on those defined in Attachment 1 of this appendix and professional judgement. A description of the methods used to determine the peak discharge rates is presented in Appendix 7-10 of this M&RP.

The disturbed and undisturbed drainage areas within and above the facilities area are presented on Plate PC7-5. A summary of the characteristics of watersheds contributing to the diversions is presented in Table 7-1.

All proposed diversions are presented on Plate PC7-5. The minimum capacity and freeboard of each diversion ditch and culvert was determined based on the minimum ditch slope. The maximum velocity and need for a channel lining or outlet protection was calculated based on the maximum ditch or culvert slope. Slopes were measured from a aerial topography generated with a 1 foot contour interval. A description of the methods used to determine diversion capacities, flow velocities, and riprap sizes is presented in Attachment 1 of this appendix. All diversion calculations are presented in Attachment 1 of this appendix.

Diversion of Perennial and Intermittent Streams. No perennial streams will be diverted at this site. The 24-inch culvert PCUC-2 will divert the runoff from the intermittent stream south of the portal. The 36-inch culvert PCUC-3 will divert runoff from the intermittent stream north of the site. The design calculations for both culverts can be found in Attachment 1 of this appendix.

Diversion of Miscellaneous Flows. Diversion ditches and culverts have been utilized within the fan portal area to divert miscellaneous flows from disturbed and undisturbed area drainages.

Diversion Ditches. A summary table of the minimum channel geometry, channel slope, peak discharge, minimum riprap requirements, maximum flow velocity and minimum freeboard values for each diversion ditch within the facilities area is presented in Table 7-3. All calculations are contained in Attachment 1 of this appendix. Each ditch has adequate capacity and erosion protection to safely pass the peak flow resulting from the 10-year, 6-hour precipitation event. A description of the diversion ditches within the facilities area is presented in Section 732.300.

Diversion Culverts. A summary table of the culvert size, slope, peak discharge, outlet riprap, and outlet flow velocity for each culvert within the facilities area is presented in Table 7-9.

Calculations are contained in Appendix 7-9. Except for culverts UC-4 and UC-5, each culvert has adequate capacity and outlet erosion protection to safely pass the peak flow resulting from the 10-year, 24-hour precipitation event. Culverts UC-4 and UC-5 were designed to convey the peak runoff resulting from the 100-year, 6-hour precipitation event. A description of the diversion culverts within the facilities area is presented in Section 732.300.

Diversion Berms. Although several berms are noted on Plate PC7-5, these will be installed primarily to meet MSHA requirements for safety concerns adjacent to slopes. However, these

berms may also locally convey runoff from higher-elevation pads to lower-elevation pads, where it will be

TABLE 7-3
SUMMARY OF DIVERSION DITCHES

Diversion	Minimum Bottom Width (ft)	Minimum Top Width (ft)	Minimum Depth (ft)	Side Slopes (H:V)	Minimum Slope (%)	Maximum Slope (%)	Peak Flow[a] (cfs)	Required Riprap D_{50} (in)	Minimum Freeboard (ft)
PCUD-1	0	4.0	1.0	2:1	3.6	10.0	0.57	none	0.67
PCUD-2	2.5	6.5	1.0	2:1	10.4	32.3	6.33	6	0.62
PCD-1	1	4.0	1.0	2:1	14.3	36.4	0.54	none	0.88

[a] Peak discharge resulting from the 10-year, 6-hour precipitation event.

Note: Constructed dimensions of the ditches may vary. However, an adequate cross section will be maintained to ensure that the ditches have adequate hydraulic capacity.

TABLE 7-4
SUMMARY OF DIVERSION CULVERTS

Diversion Culvert	Minimum Diameter (in)	Material	Inlet Type	Outlet Slope (%)	Peak Flow[a] (cfs)	Outlet Riprap D_{50} (in)
PCUC-1	18	CMP	Mitered	6.9	0.57	none
PCUC-2	24	CMP	Mitered	10.7	6.33	12
PCUC-3	36	CMP	Mitered	2.5	19.05	6
PCDC-1	18	CMP	Mitered	24.2	0.88	6
Mine Water Discharge Culvert	6	HDPE	NA	28.2	0.70	15

[a] Peak discharge resulting from the 10-year, 6-hour precipitation event except culverts PCDC-1 (designed for the peak discharge resulting from the 25-year, 6-hour event).

conveyed via diversion ditches to the sediment trap. Since none of the berms have been designed specifically to convey runoff, no calculations concerning the hydraulic characteristics of these berms are provided.

742.400 Road Drainage

All Roads. The BLM road will be realigned as shown on Plate PC5-2, in Appendix 5-10. Once the road has been realigned it will be maintain as the rest of the road above and below the realigned segment.

743 Impoundments

All pertinent information regarding the sediment trap is presented in Sections 732.200 and 742.200.

744 Discharge Structures

The discharge structures within the permit area will be the spillway on the sediment trap and a discharge line from the underground workings. The spillway on the sediment trap will adequately pass the peak discharge from the 25-year, 6-hour precipitation event. Detailed information concerning the sediment trap is presented in Sections 732.200 and 742.200.

The spillway on the sediment trap will consist of a 18-inch diameter CMP. The spillway will discharge to a tributary of Pace Creek. The design calculations for the spillway is presented in Attachment 1 of this appendix. The spillway details are presented on Plate PC7-4.

744.100 Erosion Protection

The only discharge structures associated with an impoundment will be the spillway from the sediment trap. The flow velocity at the spillway outlet under peak flow conditions is 7.19 fps. This velocity is considered to be erosive. Therefore, riprap with a D_{50} of 6 inches (minimum) will be installed at the culvert outlet. The calculations for the spillway outlet are presented in Attachment 1 of this appendix.

744.200 Design Standards

All discharge structures within the disturbed area have been designed and will be constructed according to standard engineering procedures.

APPENDIX 7-12
ATTACHMENT 1

Hydrology Calculations

REGISTERED PROFESSIONAL ENGINEER
12-23-04
No. 189797
LAYNE D.
JENSEN
STATE OF UTAH

— Pace Canyon Portal Site —

Rainfall Depths

10-yr	6-hr	1.35 in.
10-yr	24-hr	1.95 in
25-yr	6-hr	1.65 in
25-yr	24-hr	2.35 in
100-yr	6-hr	2.05 in

Curve Numbers

The curve number will be determined by combining vegetation, Hydrologic soil group, Vegetation density, Vegetation condition, and Field observation

The vegetation type is identified as mixed conifer on Plate 3-1 This vegetation type is very similar to pinyon-juniper. In fact Mt. Nebo who did a vegetation on the portal site identified the site as being a Pinyon-juniper vegetation type. (see Plate 3-1E)

Plate 2-1 identifies two soil types in the associated watersheds Map unit 96 Rock outcrop Rubbleland Traversilla complex and map unit 84 Podo-Rock outcrop complex 50-70 percent slope. The Soil Survey of Carbon Area, Utah (1988) identifies the Hydrologic Soil Group as D.

Field observation indicates that the drainages on either side of the portal area do not flow for smaller storm events.

A general description of the vegetation type indicates a cover density between 60-70% which indicates a fair hydrologic condition.

According to Table 2-2d (pg 3) The curve number for the Pinyon-juniper vegetation type is 80

During the operational period there will also be reclaimed areas and graveled pads and roads.

The curve number for reclaimed area will be assumed to be 80 although with the use of the deep gouging method the reclaimed areas will not generate any runoff for a few years.

The curve number for the pad and road areas will be assumed to be 89 see Table 9-1 (pg 4).

Three watersheds have been identified. Three of the four watersheds are upgradient of the disturbed area and does not contain disturbed areas related to the portal contruction.

Thus these three watersheds have a curve number of 80

The third watershed contains the disturbed area. This watershed contains, undisturbed areas, road and pad areas, and reclaimed areas. The curve number will be determined by using an area weighted average.

Reclaimed	= 0.64 Acre	CN = 80
road/pad	= 0.55 Acre	CN = 90
undisturbed	= 0.74 Acres	CN = 80
	1.93 Acres	

$$CN = \frac{(0.64)(80) + (0.55)(89) + (0.74)(80)}{1.93} = 82.6 \Rightarrow 83$$

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition[2]	A[3]	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.

[2]Poor <30% ground cover (litter, grass, and brush overstory).
Fair 30 to 70% ground cover.
Good >70% ground cover.

[3]Curve numbers for group A have been developed only for desert shrub.

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Co./Dept. Earth Fax	Co. DOGM	
Phone #	Phone # 801 538-5260	
Fax # 561-[illegible]-1861	Fax #	

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Table 9.1.--Runoff curve numbers for hydrologic soil-cover complexes

(Antecedent moisture condition II, and $I_a = 0.2\ S$)

Land use	Cover: Treatment or practice	Cover: Hydrologic condition	Hydrologic soil group A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	"and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	"and terraced	Poor	63	73	80	83
	"and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		---	74	84	90	92

1/ Close-drilled or broadcast.
2/ Including right-of-way.

Watershed Area a	Drainage Area (ac)	Curve Number	S (in)	Y (%)	l (ft)	L (hr)	Time of Conc. (hr)	Peak Flow (cfs)
PCWS-1	1.93	83	2.048	44.6	679	0.032	0.053	0.54
PCWS-2	2.99	80	2.500	70.9	623	0.026	0.043	0.57
PCWS-3	39.78	80	2.500	70.4	2377	0.076	0.126	6.33
PCWS-4	149.3	80	2.500	57.7	4563	0.141	0.235	19.05

Notes

Watershed locations can be found on Plates PC7-5 and PC7-6
S = 1000/CN - 10
Y = average watershed slope = (length of contour lines)(contour interval)/(watershed area)
l = hydraulic length
L = watershed lag =(l^0.8(S+1)^0.7) / (1900(Y)^0.5)
Time of Concentration + 1.67L
Peak Flow is based on a 10-yr 6-hr storm event (calculations can be found on pages 6 to 9)

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 1.93 acres
Depth = 1.35 inches	CN = 83.00
Duration = 6.0 hrs	Time conc.= 0.05 hrs

OUTPUT SUMMARY

Runoff depth: 0.296 inches
Initial abstr: 0.410 inches
Peak flow: 0.54 cfs (0.277 iph)
at time: 2.509 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-2

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 2.99 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.04 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 0.57 cfs (0.190 iph)
at time: 2.505 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-3

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 39.78 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.13 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 6.33 cfs (0.158 iph)
at time: 2.537 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-4

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 149.30 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.24 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 19.05 cfs (0.127 iph)
at time: 2.632 hrs

- Drainage Ditch Design -

Assumptions

1) All ditches designed for the 10-yr 6-hr storm event

2) When riprap is required the method presented by Searcy, (1967) will be used (see pg 22)

3) Riprap thickness is two times the D_{50}.

4) A Mannings n of 0.03 will be assumed for bare earth.

5) A Mannings n of 0.035 will be assumed for rocky earth.

6) A Mannings n for riprap channels will be determined using the following equation:

$$n = 0.0456 (D_{50} \times Slope)^{0.159}$$

(Abt. S.R. et.al. 1987)

D_{50} = median riprap size (in)
Slope = (ft/ft)

7) Filter blankets under riprap channels will be 1/2 the riprap thickness

PCUD-1

Contributing watershed is PCWS-2

Q_{10-6} = 0.57 cfs

minimum slope = 3.6 %

maximum slope = 10 %

Triangular ditch

Side slopes = 2:1
Depth = 1'

Max velocity = 3.85 fps No riprap
Max depth = 0.33 ft
freeboard = 0.67 ft

See pages 13+14 for calculation sheets
See page 19 for the figure

PCUD-2

Contributing watershed is PCWS-3

Q_{10-6} = 6.33 cfs

minimum slope = 10.4 %

maximum slope = 32.3 %

Trapizoidal ditch

Side slopes = 2:1
Depth = 1'
Bottom Width = 2.5'
Riprap D_{50} = 6"

Max. Velocity = 6.58 fps < 7.5 fps ∴ ok
Max depth = 0.38 ft < 1 ft ok
freeboard = 0.62 ft

See pages 15+16 for the calculation sheet
See page 20 for the figure

PCO-1

Contributing watershed: Depending on final grading upto 100% of the watershed will drain to this ditch
Assume 100% of PCWS-1

$Q_{10-6} = 0.54$ cfs

minimum slope = 14.3 %

max slope = 36.4 %

Triangular ditch

Bottom Width = 1'
Side slope 2:1
Flow is against the berm on one side
Depth = 1 ft

max velocity = 4.75 fps ∴ no riprap
max depth = 0.12 ft
freeboard = 0.88 ft

See pages 17+18 for the calculation sheets
See page 21 for the figure.

PCUD-1 MIN SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon Portal
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	bare earth
Slope	0.036000 ft/ft	
Left Side Slope	2.00 H : V	
Right Side Slope	2.00 H : V	
Bottom Width	0.00 ft	
Discharge	0.57 cfs	

Results		
Depth	0.33 ft	< 1.0' ∴ ok
Flow Area	0.2 ft²	
Wetted Perimeter	1.47 ft	
Top Width	1.32 ft	
Critical Depth	0.35 ft	
Critical Slope	0.027279 ft/ft	
Velocity	2.62 ft/s	
Velocity Head	0.11 ft	
Specific Energy	0.44 ft	
Froude Number	1.14	
Flow Type	Supercritical	

PCUD-1 MAX SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon Portal
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	bare earth
Slope	0.100000 ft/ft	
Left Side Slope	2.00 H : V	
Right Side Slope	2.00 H : V	
Bottom Width	0.00 ft	
Discharge	0.57 cfs	

Results		
Depth	0.27 ft	
Flow Area	0.1 ft²	
Wetted Perimeter	1.22 ft	
Top Width	1.09 ft	
Critical Depth	0.35 ft	
Critical Slope	0.027279 ft/ft	
Velocity	3.85 ft/s	< 5 fps ∴ no riprap
Velocity Head	0.23 ft	
Specific Energy	0.50 ft	
Froude Number	1.84	
Flow Type	Supercritical	

PCUD-2 MIN SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.042	$D_{50} = 6''$
Slope	0.104000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	6.33	cfs

Results		
Depth	0.38	ft
Flow Area	1.3	ft²
Wetted Perimeter	4.21	ft
Top Width	4.03	ft
Critical Depth	0.51	ft
Critical Slope	0.037939	ft/ft
Velocity	5.06	ft/s
Velocity Head	0.40	ft
Specific Energy	0.78	ft
Froude Number	1.60	
Flow Type	Supercritical	

PCUD-2 MAX SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon Portal
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.051	$D_{50} = 6''$
Slope	0.323000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	6.33	cfs

$n = 0.0456 (D_{50} \times Slope)^{0.159}$

(Abt et al, 1987)

$n = 0.0456 (6 \times 0.323)^{0.159} = 0.051$

Results		
Depth	0.31	ft
Flow Area	1.0	ft²
Wetted Perimeter	3.88	ft
Top Width	3.73	ft
Critical Depth	0.51	ft
Critical Slope	0.054546	ft/ft
Velocity	6.58	ft/s
Velocity Head	0.67	ft
Specific Energy	0.98	ft
Froude Number	2.29	
Flow Type	Supercritical	

< 7.5 fps $\therefore$ ok

PCD-1 MIN SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	rocky earth
Slope	0.143000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	0.54	cfs

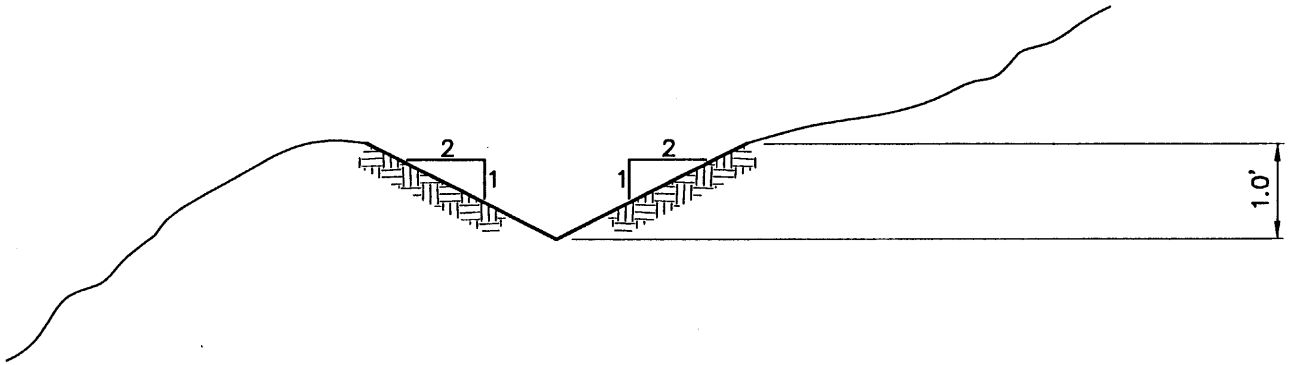
Results		
Depth	0.12	ft << 1.0' ok
Flow Area	0.2	ft²
Wetted Perimeter	1.56	ft
Top Width	1.50	ft
Critical Depth	0.18	ft
Critical Slope	0.036299	ft/ft
Velocity	3.46	ft/s
Velocity Head	0.19	ft
Specific Energy	0.31	ft
Froude Number	1.89	
Flow Type	Supercritical	

PCD-1 MAX SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	rocky earth
Slope	0.364000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	1.00	ft
Discharge	0.54	cfs

Results		
Depth	0.10	ft
Flow Area	0.1	ft²
Wetted Perimeter	1.43	ft
Top Width	1.38	ft
Critical Depth	0.18	ft
Critical Slope	0.036299	ft/ft
Velocity	4.75	ft/s < 5.0 fps ∴ OK
Velocity Head	0.35	ft
Specific Energy	0.45	ft
Froude Number	2.92	
Flow Type	Supercritical	



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PCUD–1

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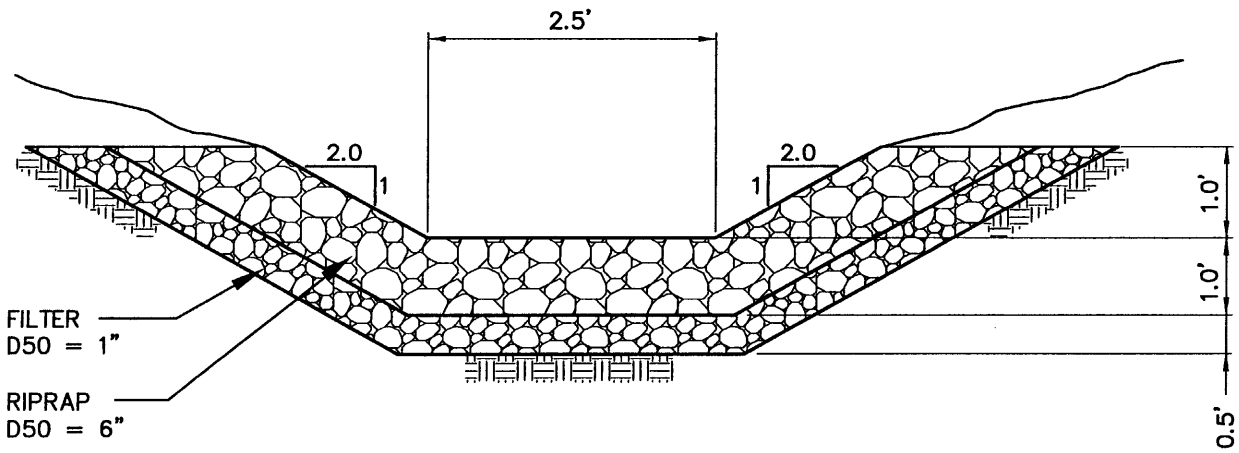

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PCUD-2

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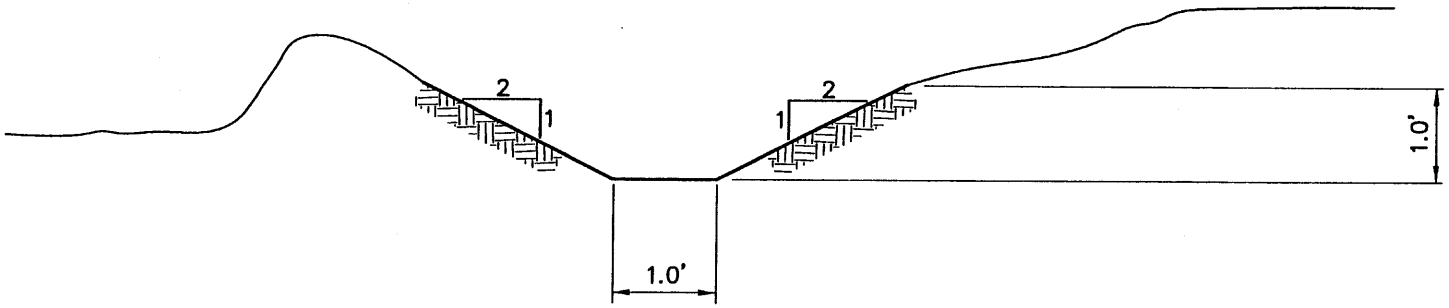

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PCD–1

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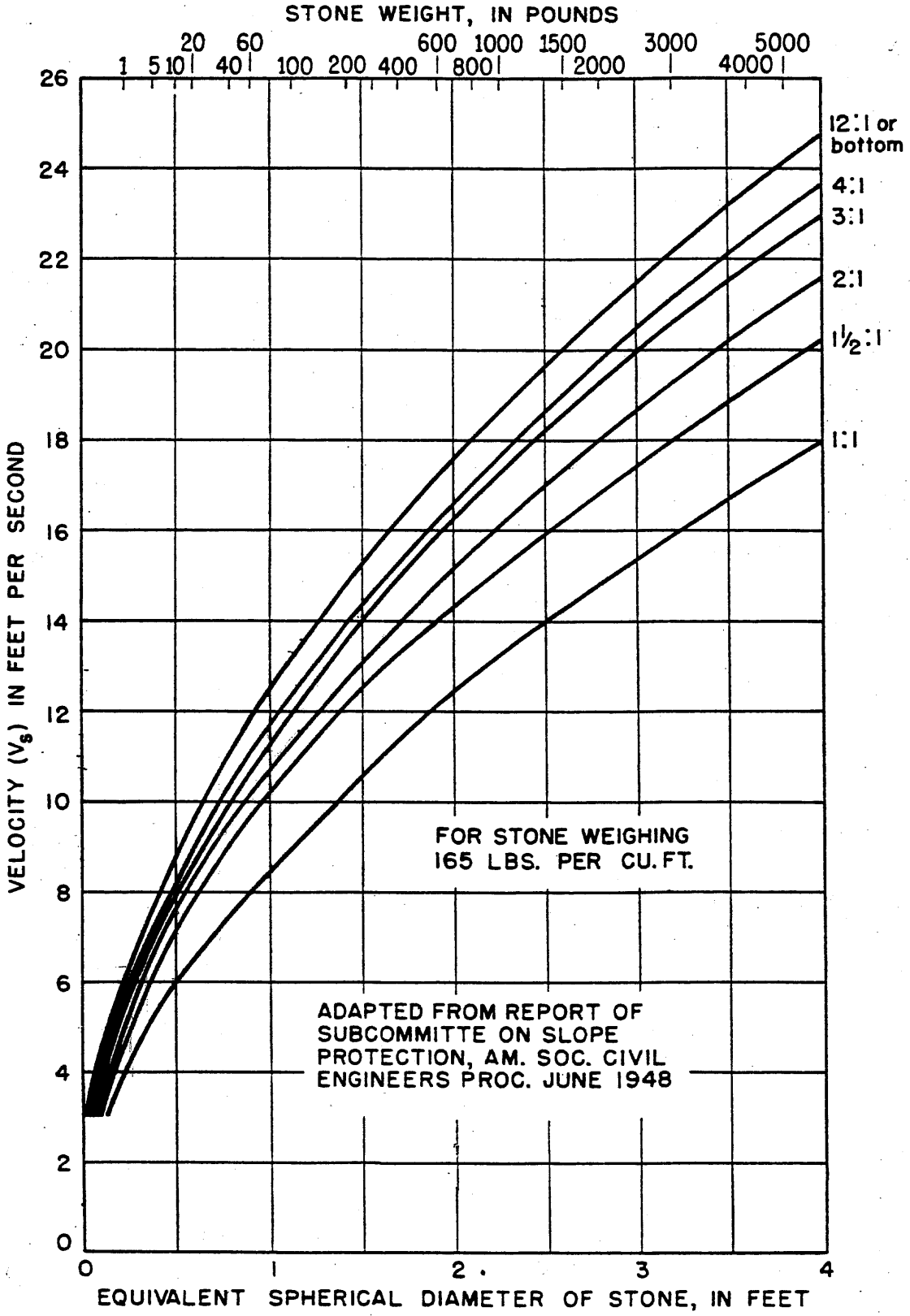

FIG. 2-SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

Searcy, J.K. 1967. Use of Riprap for Bank Protection. U.S. Dept. of Transportation, Bureau of Public Roads, U.S Government Printing Office, Washington D.C.

— Culvert Design —

PCUC-1

All of PCWS-2 will flow into this culvert

$$Q_{10-6} = 0.57 \text{ cfs}$$

The inlet capacity using the nomograph on page 30 indicates a minimum culvert size less than 12"

To minimize the chance of clogging an 18" culvert should be used. Minimum inlet capacity of 5.5 cfs.

Check culvert capacity.

18" CMP
Slope = 6.9 %

See pg 26 for calculation sheet.

Max. depth = 0.2'
Discharge velocity = 4.07 fps
No Riprap required at culvert outlet.

PCUC-2

Contributing Watershed: PCWS-3

$$Q_{10-6} = 6.33 \text{ cfs}$$

The inlet capacity nomograph on page 30 indicates a 21" culvert could handle the design flow.

To add a factor of safety a 24" CMP should be used. Minimum inlet capacity 11 cfs

Check culvert capacity

24" CMP
Slope = 12.7 %

See page 27 for calculation sheet

max depth = 0.54 ft
Discharge velocity = 9.31
outlet riprap required.

Assuming 2:1 side slopes in the channel where the culvert outlets a D_{50} = 12" riprap will resist displacement and dissipate energy. D_{50} = 12" riprap should extend 15' below the culvert.

see pg 22 for riprap figure.

PCUC-3

All of PCWS-4 will flow into this culvert

$Q_{10-6} = 19.05$ cfs

The inlet capacity using the nomograph on page 30 indicates a minimum culvert size of 27"

To minimize the chance of clogging and to provide some extra capacity use a 36" culvert which has an inlet capacity of over 30 cfs

Check culvert capacity

36" CMP
Slope = 2.5 %

See page 28 for calculation sheet.

max. depth = 1.2' < 3' ok
Discharge velocity = 7.27 fps
Riprap required
Use D_{50} = 6" Riprap at the outlet

Mine Water Discharge Culvert

Flow up to 300 gpm = 0.7 cfs

Water will be pumped out of the mine. Therefore, inlet capacity is not an issue.

Check Culvert Capacity 6" HDPE Culvert.

Slope = 35'/134' = 28.2%

max depth = 0.17' < 0.5' ∴ ok
Discharge velocity = 11.75 fps Outlet protection required

Place D_{50} = 15" at the culvert outlet

PCUC-1
Worksheet for Circular Channel

Project Description	
Worksheet	PACE CANYON PORTAL
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	CMP
Slope	0.069000	ft/ft
Diameter	18	in
Discharge	0.57	cfs

Results		
Depth	0.20	ft
Flow Area	0.1	ft²
Wetted Perimeter	1.12	ft
Top Width	1.02	ft
Critical Depth	0.28	ft
Percent Full	13.3	%
Critical Slope	0.017369	ft/ft
Velocity	4.07	ft/s < 5.0 fps ∴ no riprap required
Velocity Head	0.26	ft
Specific Energy	0.46	ft
Froude Number	1.93	
Maximum Discharge	16.08	cfs
Discharge Full	14.95	cfs
Slope Full	0.000100	ft/ft
Flow Type	Supercritical	

PCUC-2
Worksheet for Circular Channel

Project Description	
Worksheet	PACE CANYON PORTAL
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.107000	ft/ft
Diameter	24	in
Discharge	6.33	cfs

Results		
Depth	0.54	ft
Flow Area	0.7	ft²
Wetted Perimeter	2.18	ft
Top Width	1.77	ft
Critical Depth	0.89	ft
Percent Full	26.9	%
Critical Slope	0.015967	ft/ft
Velocity	9.31	ft/s
Velocity Head	1.35	ft
Specific Energy	1.89	ft
Froude Number	2.65	
Maximum Discharge	43.12	cfs
Discharge Full	40.08	cfs
Slope Full	0.002669	ft/ft
Flow Type	Supercritical	

riprap required
Place $D_{50} = 12''$ at the culvert outlet

PCUC-3
Worksheet for Circular Channel

Project Description	
Worksheet	PACE CAYON PORTAL
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.025000	ft/ft
Diameter	36	in
Discharge	19.05	cfs

Results		
Depth	1.19	ft < 3' ok
Flow Area	2.6	ft²
Wetted Perimeter	4.09	ft
Top Width	2.94	ft
Critical Depth	1.40	ft
Percent Full	39.8	%
Critical Slope	0.014132	ft/ft
Velocity	7.27	ft/s > 5 ∴ need riprap at outlet use $D_{50} = 6''$
Velocity Head	0.82	ft
Specific Energy	2.01	ft
Froude Number	1.36	
Maximum Discharge	61.45	cfs
Discharge Full	57.12	cfs
Slope Full	0.002781	ft/ft
Flow Type	Supercritical	

Mine Water Discharge Culvert
Worksheet for Circular Channel

Project Description	
Worksheet	Portal Canyon
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.014	HDPE Pipe
Slope	0.282000 ft/ft	
Diameter	6 in	
Discharge	0.70 cfs	

Results		
Depth	0.17 ft	
Flow Area	0.1 ft²	
Wetted Perimeter	0.63 ft	
Top Width	0.47 ft	
Critical Depth	0.42 ft	
Percent Full	34.3 %	
Critical Slope	0.017186 ft/ft	
Velocity	11.75 ft/s	outlet riprap required
Velocity Head	2.15 ft	
Specific Energy	2.32 ft	Place D_{50} = 15 to 18" riprap at outlet
Froude Number	5.85	
Maximum Discharge	2.98 cfs	> 0.7 cfs ∴ OK
Discharge Full	2.77 cfs	
Slope Full	0.018052 ft/ft	
Flow Type	Supercritical	

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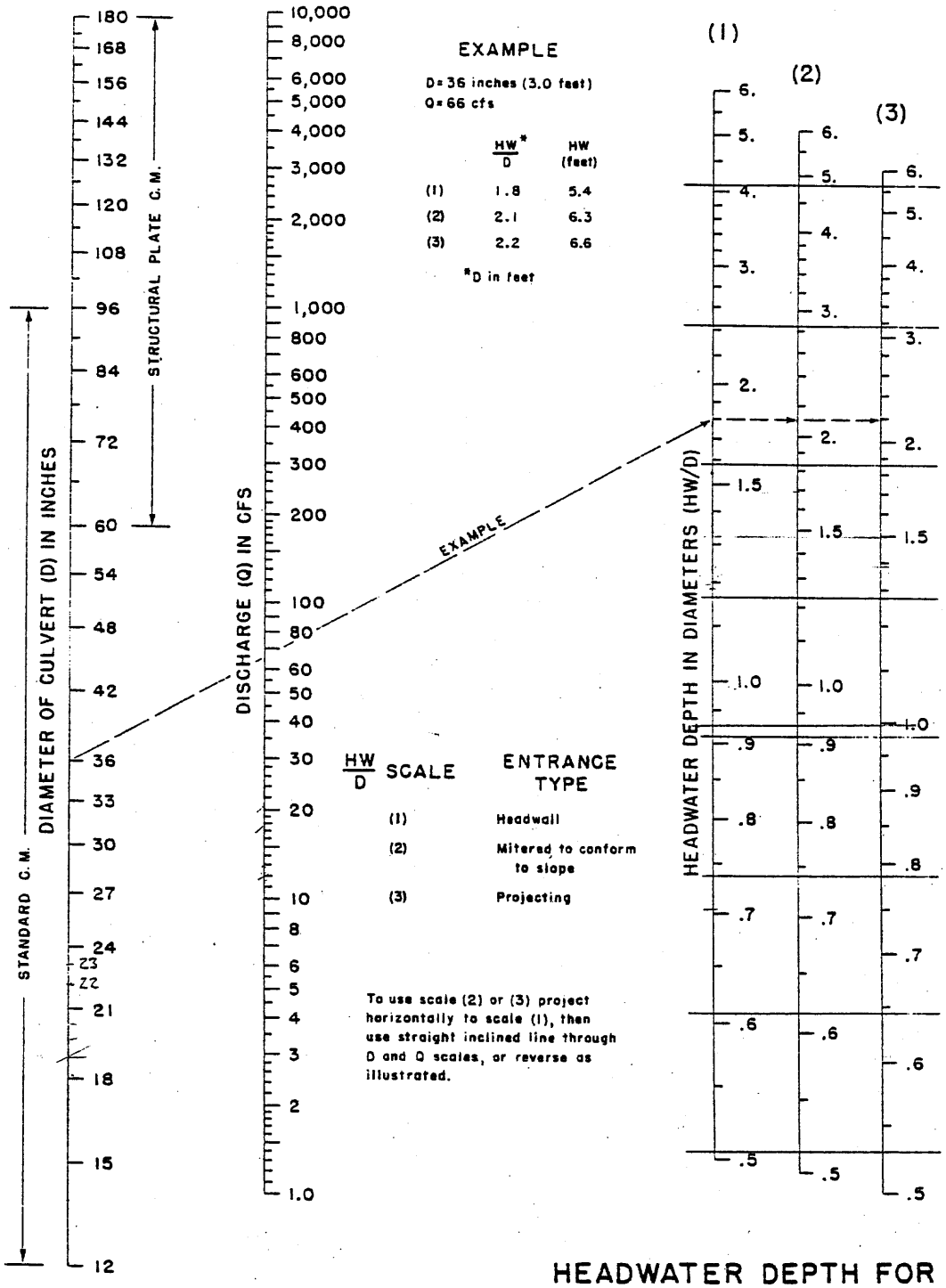
CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

Ref (U.S. Dept. of Transportation, 1977)

- Sediment Trap Design -

Sediment control at this site is being acheived using Alternate Sediment Control Measures (ASCM). These ASCMs include contemporaneous reclamation, clean gravel placed on pads and roads, silt fences (during construction) and a sediment trap.

The sediment trap is a part of the ASCM and is not intended to be a sediment pond. Thus, the sediment trap will not be designed as a sediment pond and will not have the capacity of a sediment pond.

The contemporaneous reclamation and gravel should adequately control sediment. The sediment trap will provide an extra measure of protection

Sediment Trap Capacity

elev.	Area (ft^2)	Volume (ft^3)	
6986	55.5		
		106.9	
6987	158.3		
		225.1	
6988	291.8		
		372.3	
6989	452.7		
		547.1	
6990	641.5		
		749.3	
6991	857		
		977.9	spillway elevation
6992	1098.8		
		1279.3	
6993	1459.7		
		739.9	
6993.5	1500		
		$4997.8\ ft^3$ = 0.115 Ac-ft	

The runoff depth for the 10-yr 24-hr storm event is 0.71 inches. (see page 33)

Total runoff volume = $(0.66\,in/12\,in/ft)(1.93\,Ac)(43560\,ft^2/ac) = 4623.9\,ft^3$

The sediment trap can hold approximately all of the 10-yr 24-hr storm event if the spillway is plugged.

Although not required as it is for a sediment pond the sediment trap's spillway will be designed to pass the 25-yr 6-hr storm event.

$Q_{25-6} = 0.88$ cfs (see page 32)

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1 25-YEAR 6-HOUR

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 1.93 acres
Depth = 1.65 inches	CN = 83.00
Duration = 6.0 hrs	Time conc.= 0.05 hrs

OUTPUT SUMMARY

Runoff depth: 0.468 inches
Initial abstr: 0.410 inches
Peak flow: 0.88 cfs (0.451 iph)
at time: 2.509 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCWS-1 10-YEAR 24-HOUR

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type II	Area = 1.93 acres
Depth = 1.95 inches	CN = 83.00
Duration = 24.0 hrs	Time conc.= 0.05 hrs

OUTPUT SUMMARY

Runoff depth: 0.661 inches
Initial abstr: 0.410 inches
Peak flow: 1.42 cfs (0.729 iph)
at time: 12.006 hrs

Spillway Design, (PCDC-1)

Q_{25-6} = 0.88 cfs
Use an 18" CMP.

Inlet capacity = 5.5 cfs (pg 30)

Slope = 8/33 = 24.2 %

Outlet Velocity = 7.19 fps

Requires Riprap Use D_{50} = 6" for outlet protection

SEDIMENT TRAP SPILLWAY DESIGN
Worksheet for Circular Channel

Project Description	
Worksheet	SEDIMENT SPILLWAY DESIGN
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.024	
Slope	0.242000	ft/ft
Diameter	18	in
Discharge	0.88	cfs

Results		
Depth	0.18	ft < 1.5' ∴ ok
Flow Area	0.1	ft²
Wetted Perimeter	1.07	ft
Top Width	0.98	ft
Critical Depth	0.35	ft
Percent Full	12.2	%
Critical Slope	0.016898	ft/ft
Velocity	7.19	ft/s > 5 fps ∴ needs riprap
Velocity Head	0.80	ft
Specific Energy	0.98	ft
Froude Number	3.58	
Maximum Discharge	30.11	cfs
Discharge Full	27.99	cfs
Slope Full	0.000239	ft/ft
Flow Type	Supercritical	

use $D_{50} = 6''$

- Topsoil Stockpile Sediment Control -

A berm will be constructed around the topsoil stockpile to contain all runoff from the topsoil stockpile. The berm will be designed to completely contain the runoff from the 10-yr 24-hr storm event.

Rainfall depth = 1.95" (10-yr 24-hr)

Although the topsoil stockpile will be revegetated a bare earth condition will be assumed for runoff calculations. A Hydrologic soil group of D will be assumed.

CN = 89 (Dirt Road)

$$\text{Runoff depth} = \frac{(P - 0.2S)^2}{P + 0.8(S)}$$

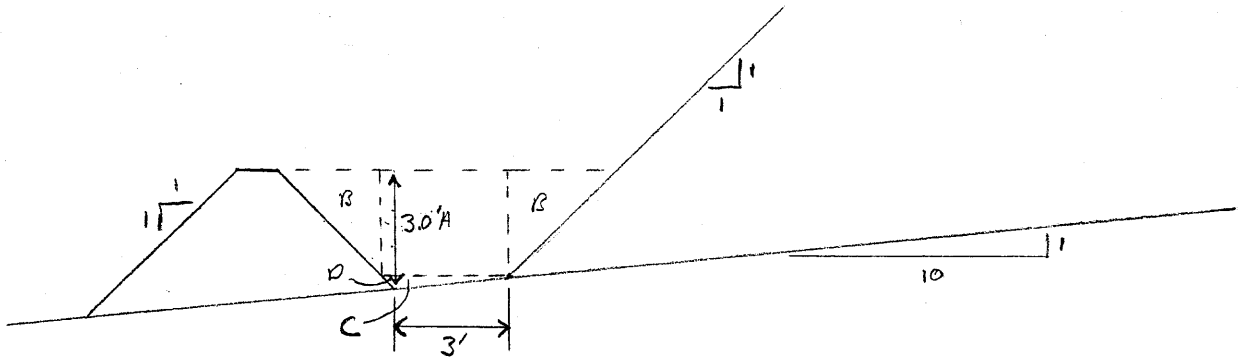
$$S = 1000/CN - 10 = \frac{1000}{89} - 10 = 1.236$$

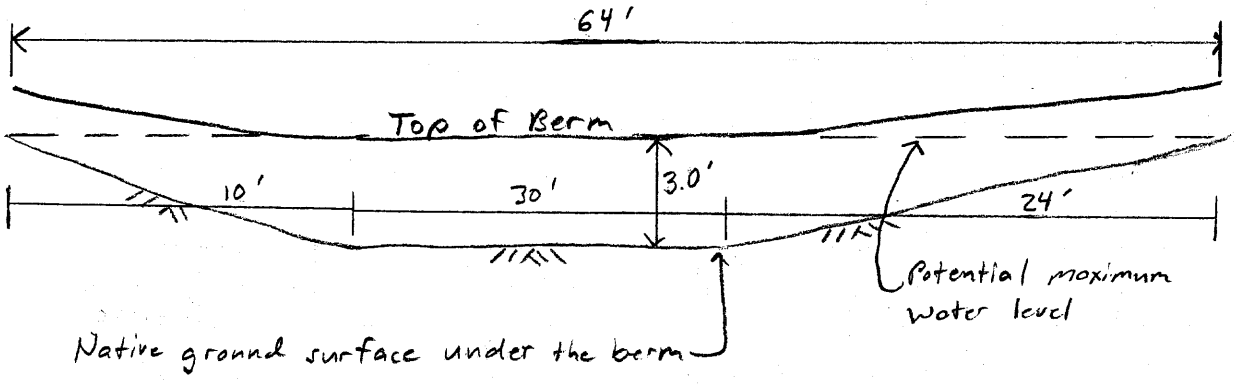
$$\text{Runoff depth} = \frac{(1.95 - 0.2(1.236))^2}{1.95 + 0.8(1.236)} = \frac{2.8995}{2.9388} = 0.99''$$

Topsoil stockpile area = 7085 ft^2

Runoff Volume = $(7085\ ft^2)(0.99/12) = 584.5\ ft^3$

$$\text{Area} = \overset{A}{(2.7)(3.3)} + \overset{B}{2(\tfrac{1}{2}(2.7 \times 2.7))} + \overset{C}{\tfrac{1}{2}(3 \times 0.3)} + \overset{D}{\tfrac{1}{2}(0.3 \times 0.3)} = 16.7\ ft^2$$





Berm length retaining runoff = 64'

Containment Volume = $(16.7\ ft^2)(30') + \frac{1}{2}(10')(16.7\ ft^2) + \frac{1}{2}(24)(16.7\ ft^2)$

$= 501 + 83.5 + 200.4 = 784.9\ ft^3$

Required containment = $584.5\ ft^3 < 784.9\ ft^3$ ∴ OK

A 3.0' tall berm should be constructed on the lower part of topsoil stockpile. The berm along the road and in the higher areas only needs to be about 1' tall.

APPENDIX 7-12
ATTACHMENT 2

Alternate Sediment Control Calculations

REGISTERED PROFESSIONAL ENGINEER
12-23-04
No. 189797
LAYNE D.
JENSEN
STATE OF UTAH

Comparison of Pre-Mining, Operational and Post-Reclamation Sediment Yields for the Pace Canyon Fan Site

Sediment control during the operational phase and after reclamation will be by Alternate Sediment Control Measures ("ASCM"). Sediment control during the operational phase will be a blend of contemporaneous reclamation, covering pad areas with gravel, reseeding areas and a sediment trap. The ASCM used successfully for the reclamation of many sites will be used for the reclamation of this site. The reclamation sediment control methods to be applied at this site are as follows:

1. Deep gouging;
2. Mixing hay into the soil;
3. Mulching the gouged surface;
4. Securing the mulch with a tackifier; and
5. Revegetation.

The purpose of this calculation is to evaluate the sediment yield characteristics of the disturbed area under pre-mining, operational and post-mining conditions. The four conditions to be evaluated will be as follows:

1. Pre-mining, This site was disturbed by previous logging, mining and grazing access activities. The site has been disturbed for nearly 100 years. Hence pre-disturbance information is not available and the pre-mining condition is a disturbed condition. Although the pre-mining condition is a disturbed condition where possible an undisturbed condition will be assumed for these calculations.

2. Operational, after the site is constructed and ASCM have been installed. The sediment trap will not be accounted for in this calculation.

3. Immediate Post-Reclamation, after deep gouging, mulching and seeding but before vegetation establishment.

4. Long Term Post-Reclamation, after vegetation is well established and depressions from deep gouging are mostly gone.

During the operational phase 2 inches of washed gravel (2" minus) will be placed on the flatter portions of the pad area. The steeper areas around the portal will be covered with riprap. Areas disturbed by construction with slopes at 2:1 or less and that will not be impacted by operational activities will reclaimed using the same methods as for final reclamation. Areas with a slope greater than 2:1 or which may be disturbed during operations will be mulched and hydroseeded. The topsoil stockpile will be gouged and hydroseeded but will not generate any sediment since the stockpile will be surrounded by a berm that will completely contain all runoff and sediment. See Plate 7-5A to see where the various ASCM are being used.

Contemporaneous and final reclamation consists of mixing 2 tons/acre hay into the soil during deep gouging. Another 1 to 1.5 tons/acre of straw mulch will be broadcast on the surface. The straw mulch will be secured with a tackifier when the site is hydroseeded. A small amount of wood fiber mulch will also be applied with the tackifier during hydroseeding.

Since all three time periods contain a road none of the calculations will include sediment yield from the road.

Methodology

Sediment yield calculations will be made using the Modified Universal Soil Loss Equation ("MUSLE") as presented by Israelsen et. al. (1984) and Barfield et. al. (1994)

$$A = R*K*LS*VM$$

where:

A = Sediment Yield (tons/acre/year)
R = Rainfall Factor
K = Soil Erodibility Factor
LS = Length and Steepness of slope factor
VM = Erosion Control Factor

Each of the above factors will be evaluated for each of the three conditions.

Rainfall Factor (R)

R=15 From Map R7 Israelsen et. al. (1984)

The same factor will apply for all four conditions.

Soil Erodibility Factor (K)

As mentioned above the site has been disturbed for a long time and pre-disturbance data are not available. The Soil Survey of Carbon Area, Utah catagorizes soils in the vicinity of the site that were not disturbed at the time of the survey. The bottom of the canyon with relatively flat slopes are identified as map unit 96 Rock outcrop-Rubbleland-Travesilla Complex. The erodibility factor identified in Table 12 on page 279 is 0.10 for the surface sample and 0.37 for soils at a depth greater than 3 inches. Since the surface and subsoils have been mixed at the site I will assume a soil erodibility factor of 0.3 for all conditions since the same soil will be used during contemporaneous and final reclamation.

The soil erodibility factor for graveled surface will be assumed to be 0.05 for the operational period.

Length-Steepness Factor (LS)

$$LS = \left[\frac{65.41\,s^2}{s^2+10{,}000} + \frac{4.56\,s}{\sqrt{s^2+10{,}000}} + 0.065\right]\left(\frac{l}{72.6}\right)^m$$

Where:

LS = Length Steepness Factor
S = Slope Gradient (%)
l = Slope Length (ft)
m = empirical exponent (function of slope)

Pre-mining

Based on the undisturbed topography in the vicinity of the site the natural slopes range between 40% and nearly vertical on the rock outcrops. Since this is the baseline for comparison of the sediment yield during each condition I will assume a slope of 40% to be conservative. In an undisturbed condition the slopes extend unbroken from the ridge lines down to the channels in the canyons. These distances may be thousands of feet. However, this site is between two drainages and the maximum slope length is about 800' with an average slope length of 400' to 500'. For the undisturbed condition I will assume a slope of 40% and a slope length of 400'.

LS = 25.3 (Table 2 Israelsen et. al. (1984))

Operational Period

A different LS factor will be used for the different conditions at the site. The undisturbed areas will use the same LS factor as above (LS=25.3). The graveled and riprapped areas of the site have a conservative slope length of 400' and an average slope of about 12.5%

LS = 3.84 (Table 2 Israelsen et. al. (1984))

For the areas to be reseeded but not gouged I will assume the worst case which is the 1:1 slope above the fan with a slope length of 40 feet.

LS = 26.72 (Table 2 Israelsen et. al. (1984))

The LS factor for the reclaimed areas will be the same as determined for the reclaimed condition below.

Immediate Post Reclamation

The reclaimed areas will be deep gouged prior to seeding. Deep gouging creates 1 to 3' deep holes that prevent runoff from concentrating and achieving an erosive velocity. In the early

stages of reclamation the gouges prevent any water from running off the reclaimed areas. The gouges also stop any runoff from upgradient undisturbed areas. Therefore, the slope length is very short. I will assume a slope length of 10' although the distance is actually less. The maximum slope of reclamation is a 2:1 slope or 50%. I will assume the maximum slope of 50% and a slope length of 10'.

LS = 5.64 (Table 2 Israelsen et. al. (1984))

Long-term Post Reclamation

In the long term the depressions from gouging will disappear leaving an unbroken slope with a maximum slope of 50%. However, most of the reclaimed site will have slope much lower than 50%. I will assume a 35% slope and the same slope length as for the pre-mining condition (400').

LS = 20.44 (Table 2 Israelsen et. al. (1984))

Erosion Control Factor (VM)

Pre-Mining

A vegetation study was performed for this site. The following are the results of the vegetation study. I will use the these values to estimate the Erosion Control Factor.

Total vegetation cover = 52.5%
Litter/rock cover = 33.84%
Bare soil = 21.5%

Grass density = 4.4%
Forbs = 18.0%
Shrubs = 22.3%
Overstory (trees) = 7.8%
Canopy of tall weeds (shrubs plus trees) = 30.1%

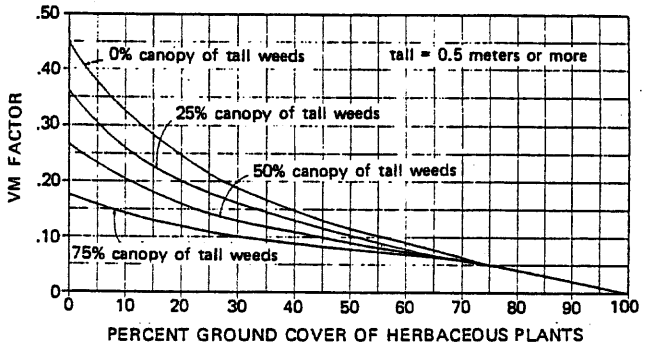


Figure 8. Relationship between forb density and VM factor.

Israelsen et. al. (1984)

VM = 0.2

Operational

The undisturbed areas will use the same value as for the pre-mining condition.

The gravel placed on the site will be like a stone mulch. Figure 6 from Israelsen et. al. (1984) estimates the VM based on R*K*LS and the tons/acre of stone mulch. The gravel is to be placed 2 inches thick. I will assume a density to 115 lbs/ cubic foot.

(2"/12 in/ft)(43560 ft^2/acre)(115 lbs/cubic foot)/(2000 lbs/cubic foot) = 417.5 tons/acre

R * K * LS = 15*0.3*3.84 = 17.3

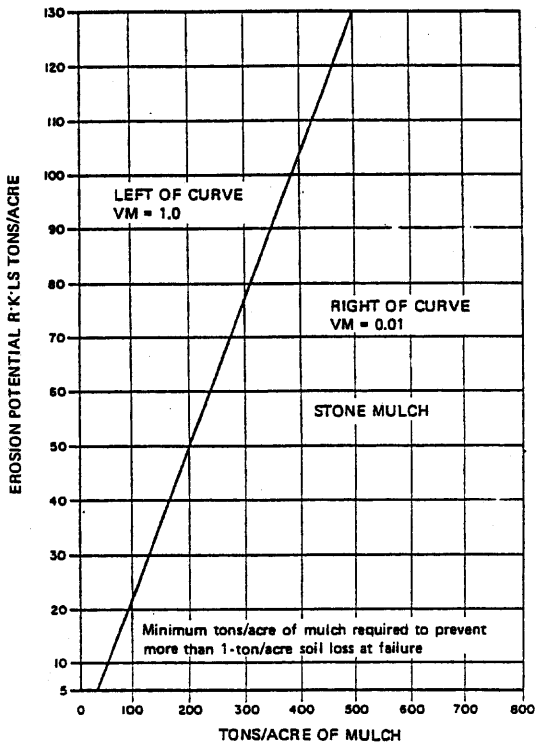


Figure 6. Stone mulch vs. R·K·LS.

VM = 0.01

The reseeded areas will likely not have very good vegetation. However, the native soil is very rocky. This rocky surface will reduce the erosion. Table 3 in Israelsen et. al. (1984) gives a range of values for scraped soil between 0.66 and 1.30. Due to the rock content in the soil and some limited vegetation I will assume a VM = 0.9

Immediate Post Reclamation

$$R * K * LS = 15*0.3*5.64 = 25.38$$

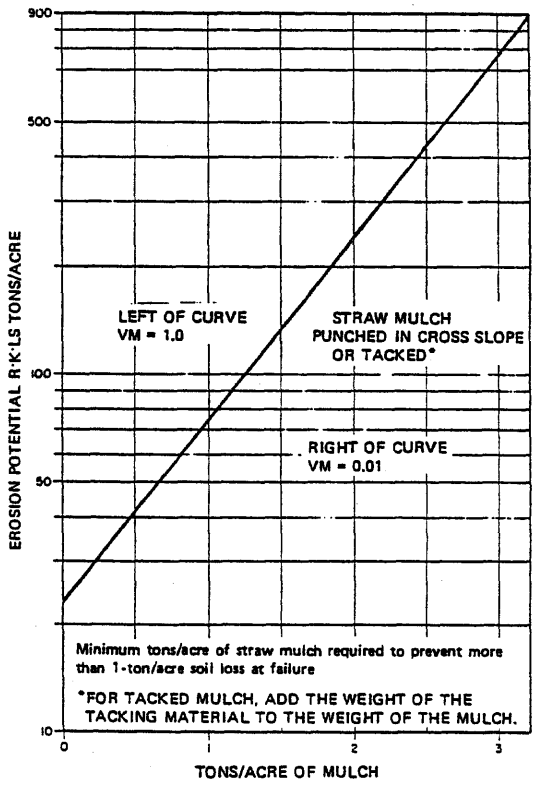


Figure 4. Straw mulch anchored vs. R·K·LS.

At least 1 ton/acre of mulch will be added with a tackifier to the reclaimed surface. Therefore, the point plots on the right side of the line.

$$VM = 0.01$$

Long-term Post Reclamation

I will assume the same vegetation as for the pre-mining condition.

$$VM = 0.2$$ (see figure 8 on page 5)

Calculation Summary

Time Period	R	K	LS	VM	A (tons/acre/yr)	Area (acre)	tons/yr
Pre-Mining	15	0.30	25.3	0.20	22.77	2.61	59.43
Operational							
undisturbed	15	0.30	25.3	0.20	22.77	1.27	28.92
gravel	15	0.05	3.84	0.01	0.03	0.63	0.02
revegetated	15	0.30	26.72	0.90	108.22	0.22	23.80
reclaimed	15	0.30	5.64	0.01	0.12	0.29	0.04
					Operational Total	2.46	52.78
Immediate Post Reclamation	15	0.30	5.64	0.01	0.12	2.61	0.31
Long-term Post Reclamation	15	0.30	20.44	0.20	18.40	2.61	48.02

The area in the above table for the pre-mining and reclamation conditions is the area inside the disturbed area boundary. The operational areas do not add up to the total area inside the disturbed area boundary because the area within the topsoil stockpile berm has been removed. The topsoil stockpile is surrounded by a total containment berm and no runoff and sediment will leave this area.

As can be seen above the operational and reclaimed surfaces will generate less sediment than the pre-mining condition. The sediment trap will further reduce the sediment load reaching the creek during the operational period.

APPENDIX 7-12
ATTACHMENT 3

Reclamation Hydrology Calculations

REGISTERED PROFESSIONAL ENGINEER
12-23-04
No. 189797
LAYNE D.
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Reclamation Channels

The curve numbers identified on pages 1 and 2 for undisturbed and reclaimed areas will be used for estimating peak flows for each reclamation channel.

A summary of the watershed characteristics can be seen on the following page.

The channel design methodology can be found on pg 10 of the operational hydrology calculations.

PCRD-1

Contributing watershed is PCRWS-2

$Q_{10.6} = 6.36$ cfs (pg 5)

minimum slope = 1/8.9 = 11.2 %

maximum slope = 1/2.95 = 33.9 %

Trapizoidal ditch

Side Slope = 2:1
Depth = 1'
Bottom Width = 2.5'
Riprap D_{50} = 6"

Max. Velocity = 6.7 fps
Max. Depth = 0.38'
freeboard = 0.62'

See pages 6+7 for calculation sheets
See page 10 for the figure.

Swale 1

Contributing watershed is PCRWS-1

Q_{10-6} = 19.05 cfs (pg 4)

Slope = 3.6%

Trapizoidal swale

Side slopes = 7.5:1
Depth = 1'
Bottom width = 5'
Riprap = 2" minus gravel

Max Velocity = 4.09 fps < 5 fps no riprap just gravel

max depth = 0.52' < 1' ok
freeboard = 0.48'

See page 7 for calculation sheet.
See page 11 for the figure.

Swale 2

Contributing watershed is PCRWS-2

Q_{10-6} = 6.36 cfs

Slope = 4.4%

Triangular swale

Side slopes = 7.5:1
Depth = 1'
Bottom Width = 0'
Riprap = 2" minus gravel

max velocity = 3.48 fps < 5' ∴ no riprap just gravel

max depth = 0.49'
freeboard = 0.51'

See page 8 for calculation sheet
See page 12 for figure.

Watershed Area a	Drainage Area (ac)	Curve Number	S (in)	Y (%)	l (ft)	L (hr)	Time of Conc. (hr)	Peak Flow (cfs)
PCRWS-1	149.8	80	2.500	57.7	4593	0.142	0.237	19.05
PCRWS-2	40.3	80	2.500	70.4	2477	0.078	0.131	6.36

Notes

Watershed locations can be found on Plate PC5-5 and PC7-7
S = 1000/CN - 10
Y = average watershed slope = (length of contour lines)(contour interval)/(watershed area)
l = hydraulic length
L = watershed lag =(l^0.8(S+1)^0.7) / (1900(Y)^0.5)
Time of Concentration + 1.67L
Peak Flow is based on a 10-yr 6-hr storm event (calculations can be found on pages 4 and 5)

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCRWS-1

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 149.80 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.24 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 19.05 cfs (0.126 iph)
at time: 2.623 hrs

Triangular Hydrograph Calculations using

SCSHYDRO Program

Watershed I.D.:
PCRWS-2

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type `b'	Area = 40.30 acres
Depth = 1.35 inches	CN = 80.00
Duration = 6.0 hrs	Time conc.= 0.13 hrs

OUTPUT SUMMARY

Runoff depth: 0.216 inches
Initial abstr: 0.500 inches
Peak flow: 6.36 cfs (0.157 iph)
at time: 2.550 hrs

PCRD-1 MIN SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PORTAL CANYON RECLAMATION
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.043	$D_{50} = 6''$
Slope	0.112000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	6.36	cfs

Results		
Depth	0.38 ft	< 1.0 ' ∴ ok
Flow Area	1.2	ft²
Wetted Perimeter	4.20	ft
Top Width	4.02	ft
Critical Depth	0.51	ft
Critical Slope	0.039000	ft/ft
Velocity	5.14	ft/s
Velocity Head	0.41	ft
Specific Energy	0.79	ft
Froude Number	1.63	
Flow Type	Supercritical	

PCRD-1 MAX SLOPE
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PORTAL CANYON RECLAMATION
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.051	D_{50} = 6" Slope = 33.9 %
Slope	0.339000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.50	ft
Discharge	6.36	cfs

Results		
Depth	0.31	ft
Flow Area	1.0	ft²
Wetted Perimeter	3.87	ft
Top Width	3.73	ft
Critical Depth	0.51	ft
Critical Slope	0.055375	ft/ft
Velocity	6.67	ft/s < 7.5 fps ∴ ok
Velocity Head	0.69	ft
Specific Energy	1.00	ft
Froude Number	2.32	
Flow Type	Supercritical	

Reclamation Swale-1
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon Reclamation
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.036000	ft/ft
Left Side Slope	7.50	H : V
Right Side Slope	7.50	H : V
Bottom Width	5.00	ft
Discharge	19.05	cfs

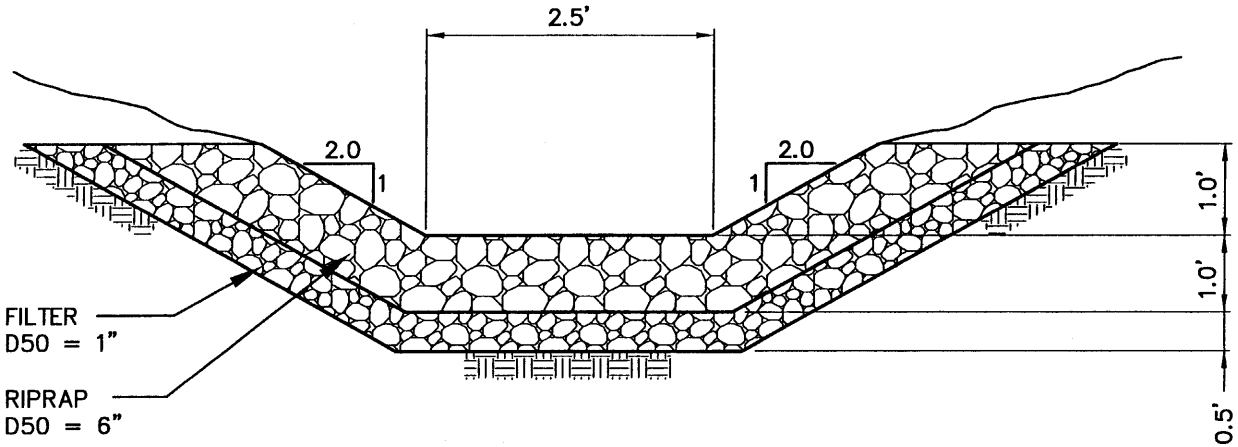
Results		
Depth	0.52	ft
Flow Area	4.7	ft²
Wetted Perimeter	12.91	ft
Top Width	12.84	ft
Critical Depth	0.58	ft
Critical Slope	0.024550	ft/ft
Velocity	4.09	ft/s
Velocity Head	0.26	ft
Specific Energy	0.78	ft
Froude Number	1.20	
Flow Type	Supercritical	

Reclamation Swale-2
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Pace Canyon Reclamation
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.044000	ft/ft
Left Side Slope	7.50	H : V
Right Side Slope	7.50	H : V
Bottom Width	0.00	ft
Discharge	6.36	cfs

Results		
Depth	0.49	ft
Flow Area	1.8	ft^2
Wetted Perimeter	7.47	ft
Top Width	7.40	ft
Critical Depth	0.54	ft
Critical Slope	0.027995	ft/ft
Velocity	3.48	ft/s
Velocity Head	0.19	ft
Specific Energy	0.68	ft
Froude Number	1.24	
Flow Type	Supercritical	



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PCRD–1

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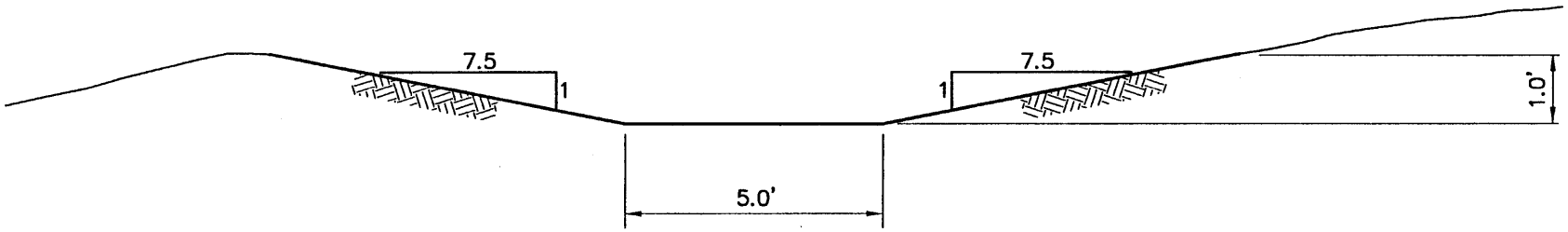

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RECLAMATION SWALE 1

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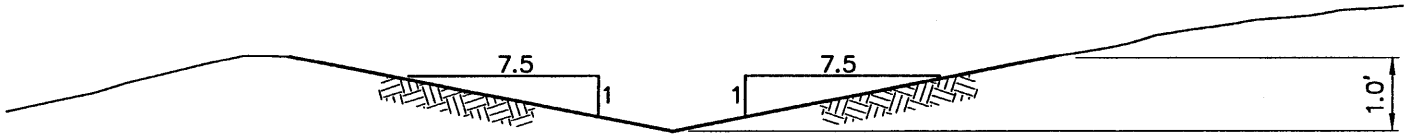

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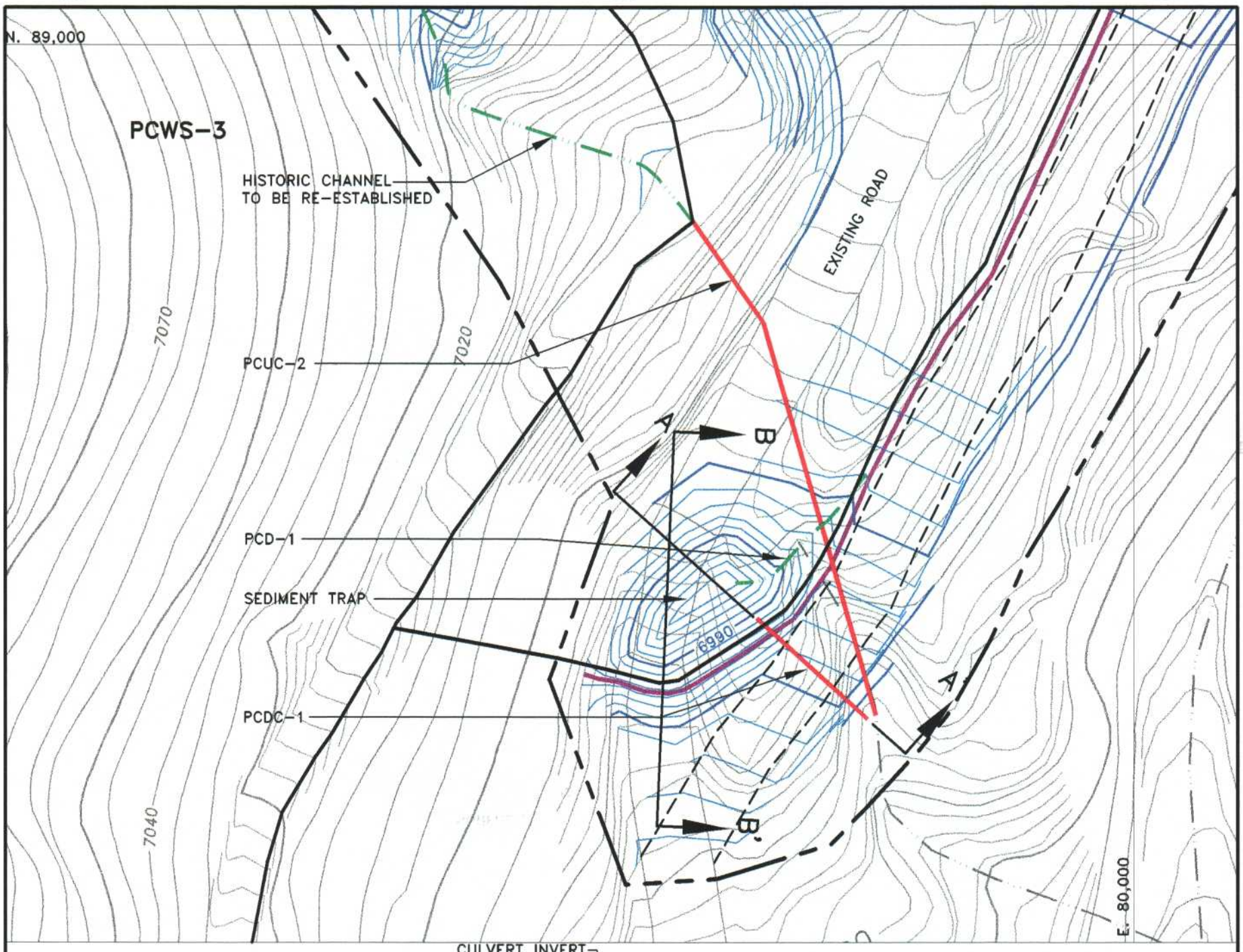

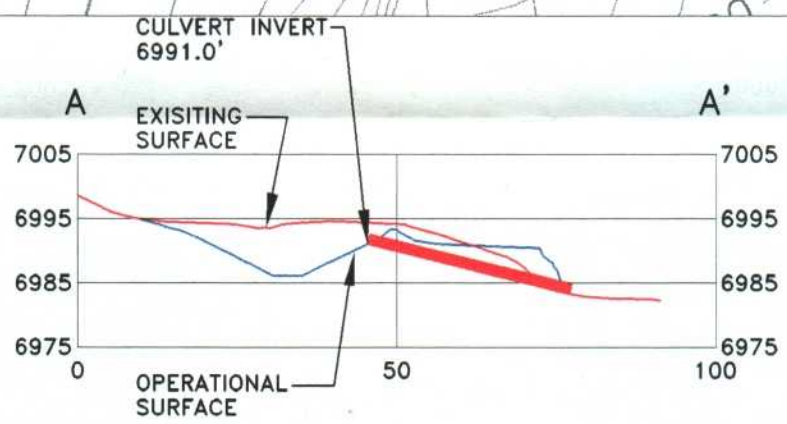

SECTION A–A'

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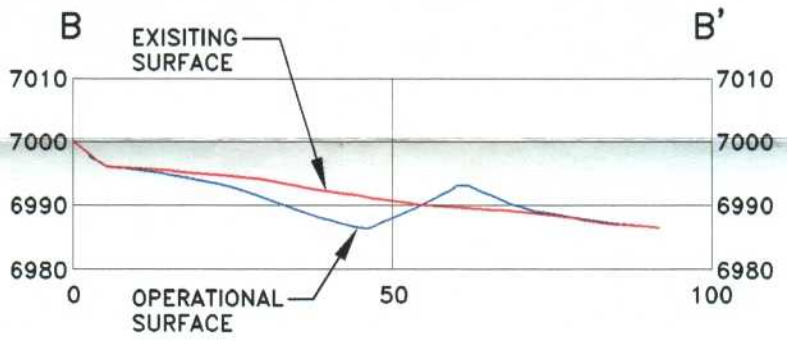

SECTION B–B'

HORZ: 1"=30'
VERT: 1"=30

TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

LEGEND

WATERSHED BOUNDARY

CULVERT

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No. 189797
LAYNE D. JENSEN
STATE OF UTAH

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Dugout Canyon Mine

PACE CANYON FAN SEDIMENT TRAP DETAIL AND CROSS SECTIONS

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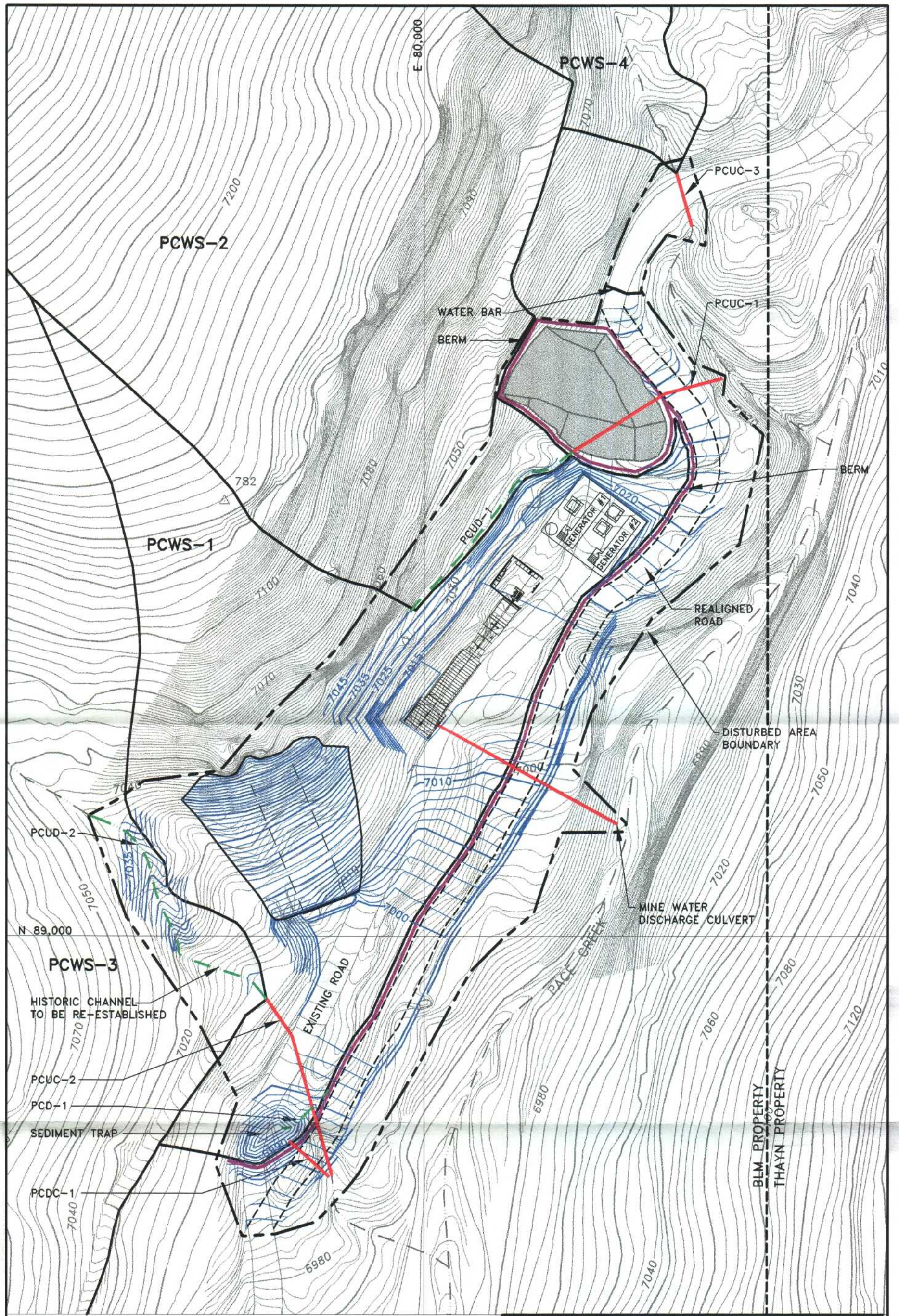

TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

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WATERSHED BOUNDARY

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Dugout Canyon Mine

PACE CANYON FAN DISTURBED AREA DIVERSIONS

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PLATE PC7-5

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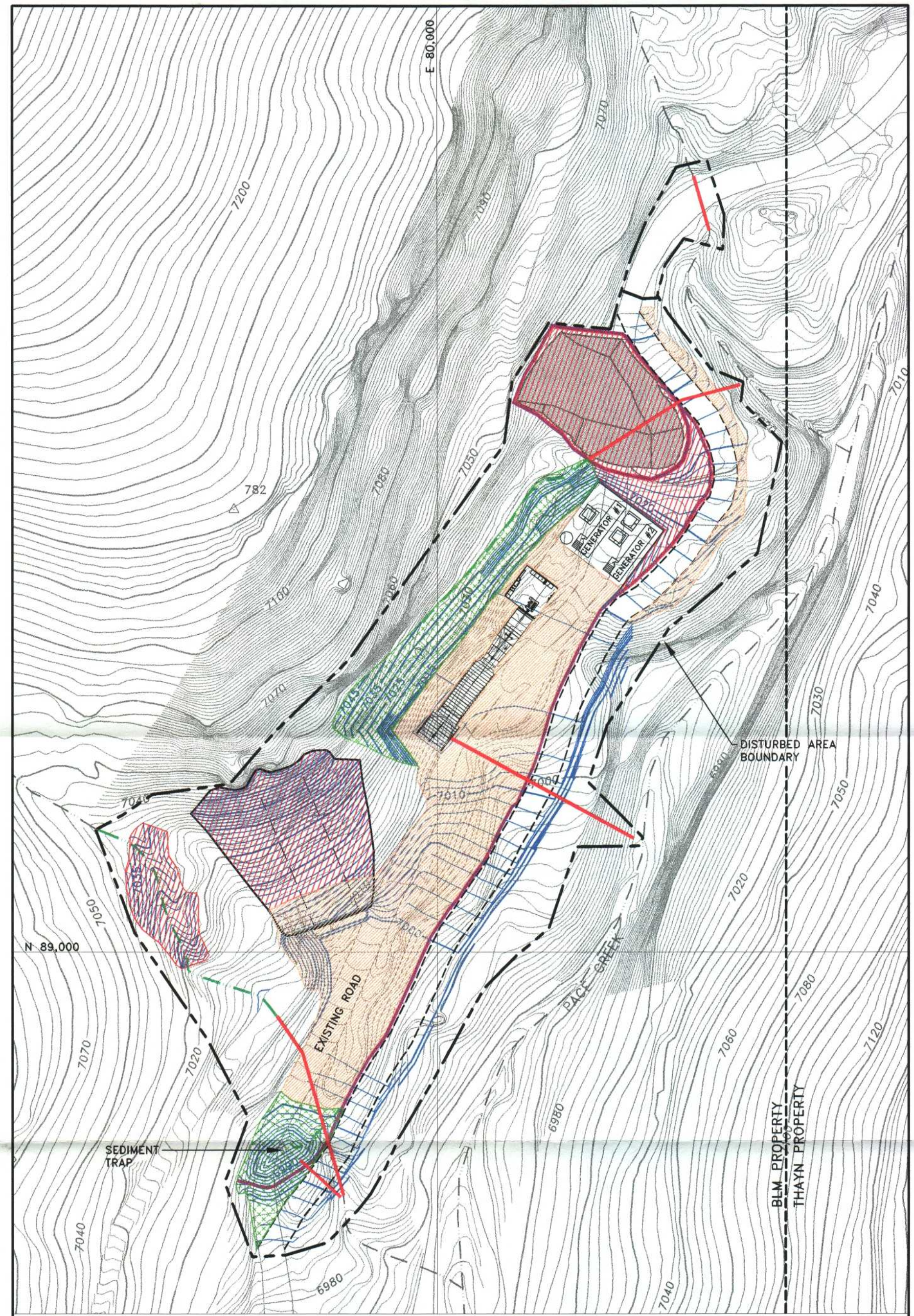

TOWNSHIP 13 SOUTH, RANGE 13 EAST, SECTION 30

TOPOGRAPHY FROM OLYMPUS AERIAL SURVEYS INC.
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LEGEND

- AREAS TO BE DEEP GOUGED, MULCHED AND HYDROSEEDED
- AREAS TO BE MULCHED AND HYDROSEEDED
- GRAVEL OR RIPRAP
- CULVERT

REGISTERED PROFESSIONAL ENGINEER No. 159797 LAYNE D. JENSEN STATE OF UTAH

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Dugout Canyon Mine

PACE CANYON FAN SEDIMENT CONTROL MAP

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PLATE PC7-5A

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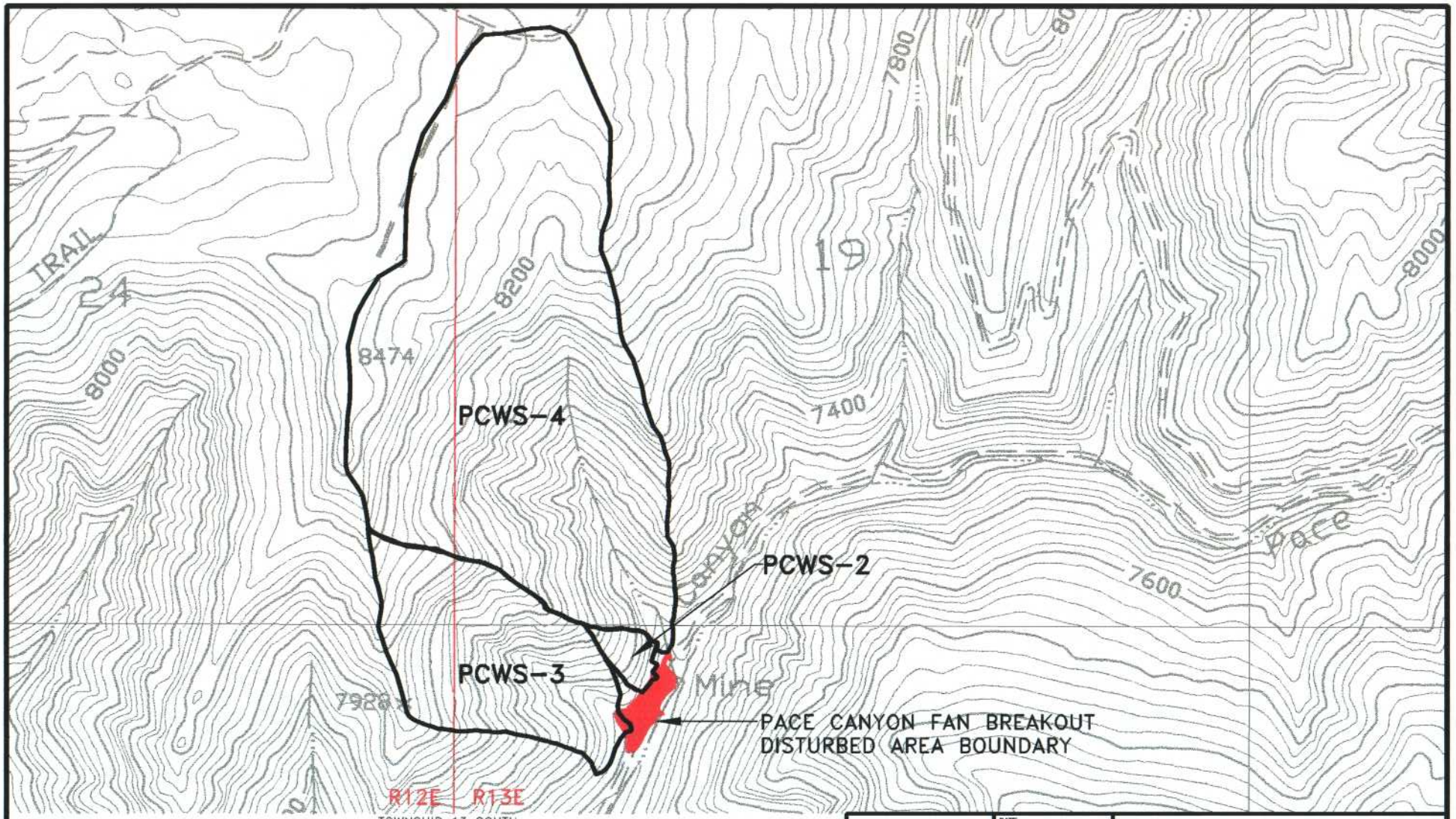

LEGEND

PACE CANYON UNDISTURBED WATERSHED BOUNDARY

REGISTERED PROFESSIONAL ENGINEER
No. 159797
LAYNE D. JENSEN
11-17-04
STATE OF UTAH

REVISIONS OR UP-DATES				
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Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN UNDISTURBED WATERSHED BOUNDARIES

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DRAWING OR MAP NUMBER
PLATE PC7-6

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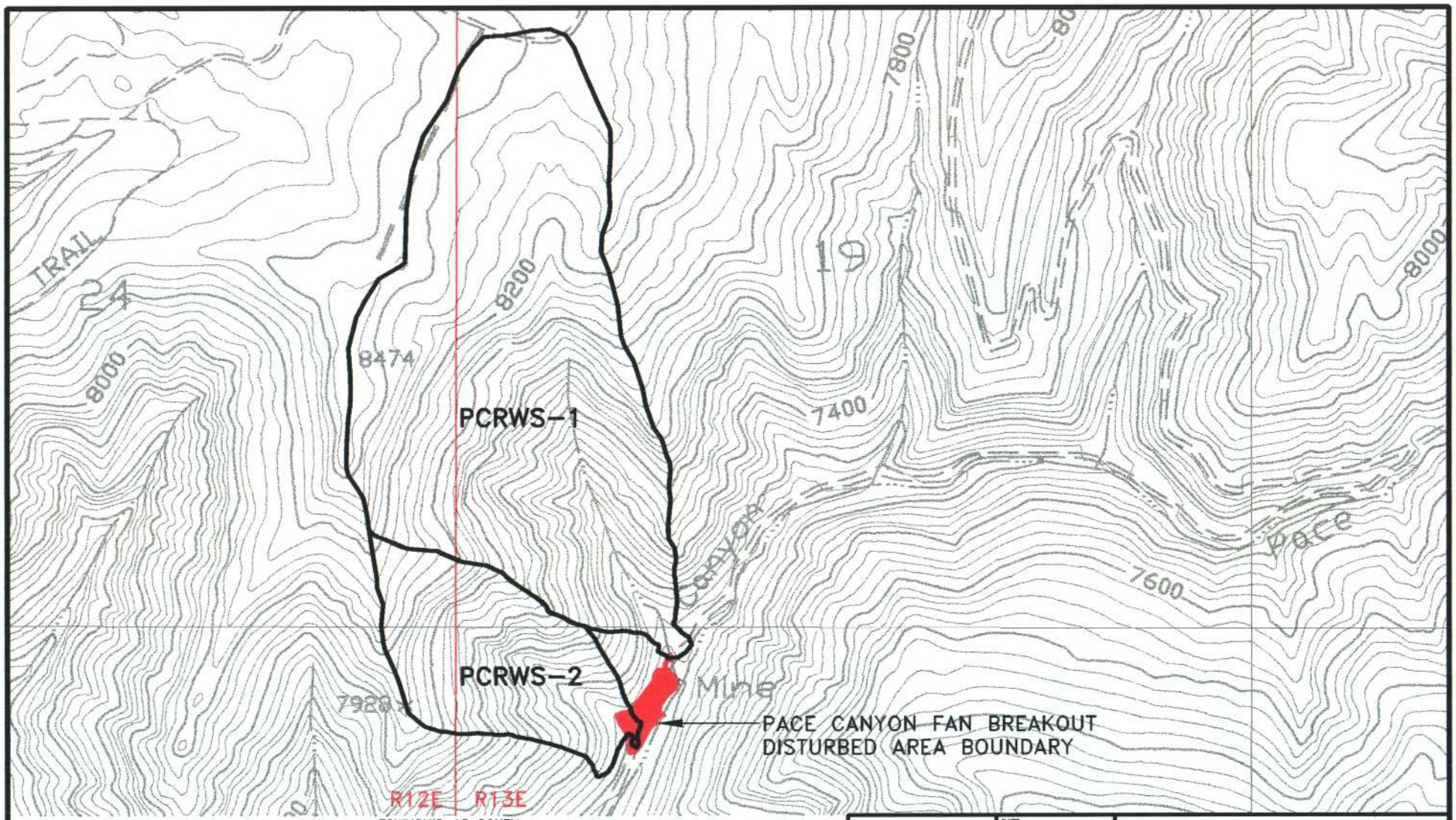

LEGEND

PACE CANYON RECLAMATION WATERSHED BOUNDARY

REGISTERED PROFESSIONAL ENGINEER No. 189797 LAYNE D. JENSEN STATE OF UTAH

REVISIONS OR UP-DATES			DATE: 11-17-04	
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Canyon Fuel Company, LLC
Dugout Canyon Mine

PACE CANYON FAN RECLAMATION WATERSHED BOUNDARIES

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PLATE PC7-7

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CHAPTER 8

BONDING AND INSURANCE

810 BONDING DEFINITIONS AND DIVISION RESPONSIBILITIES

This chapter provides information regarding the bonding for coal mining and reclamation operations at the Dugout Canyon Mine. CFC will have on file with the Division a bond or bonds made payable to the Division for performance of all the requirements of the State Program.

820 REQUIREMENT TO FILE A BOND

The disturbed area (51.11 acres plus 2.7 Pace Canyon Fan Facility = 53.81) covered by the bond is outlined on Plates 5-2, RA 5-1 and PC 5-2 of this M&RP. The disturbed area and specific acres to be reclaimed are discussed in Section 340. The performance bond period is for the duration of the coal mining and reclamation operations including the extended period designated by the Division. The bond is in the form of a surety bond and is described in Section 860.

830 DETERMINATION OF BOND AMOUNT

The reclamation bond for the Dugout Canyon Mine is $2,400,000 (2007 dollars). The most current formulas from the Office of Surface Mining, *Handbook for Calculation of Reclamation Bond Amounts*, April 2000 were used to determine the coverage necessary for reclamation (Means, 2002). Additional details concerning the estimate can be found in Section 540, 550, and Appendix 5-6.

The present bond on file with the Division should be sufficient to cover the reclamation bond. However, if an adjustment in the bond coverage is necessary, the amount will be increased/decreased per the Division's requirements.