PACIFICORP

DEER CR
NORTH RIL
PORTAL

Permit No. C/015/018
November 2003

Volume 11

R645-301-100
GENERAL

R645-301-200
SOILS

R645-301-300
BIOLOGY

R645-301-400
LAND USE &
AIR QUALITY

R645-301-500
ENGINEERING

R645-301-600
GEOLOGY

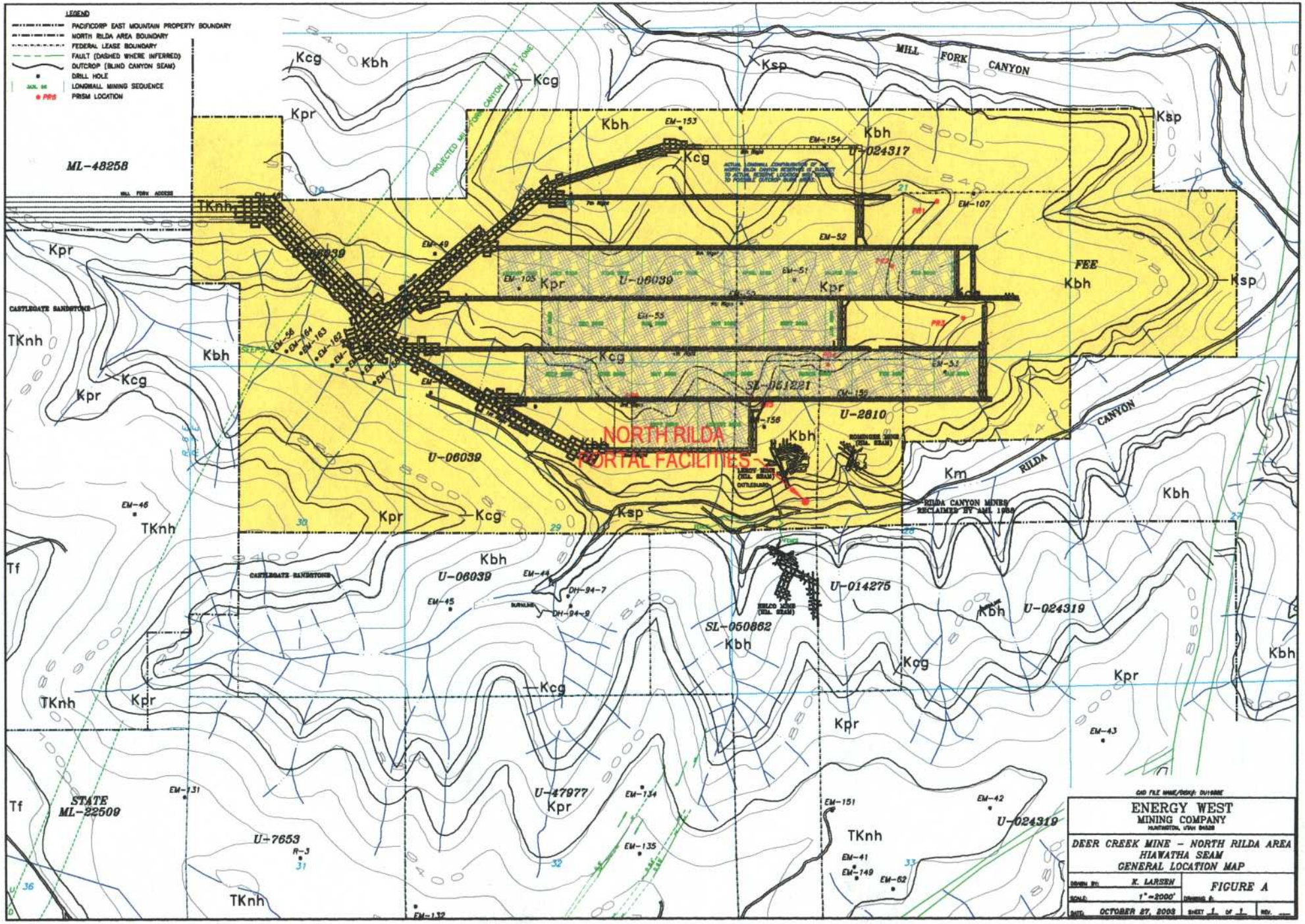
R645-301-700
HYDROLOGY

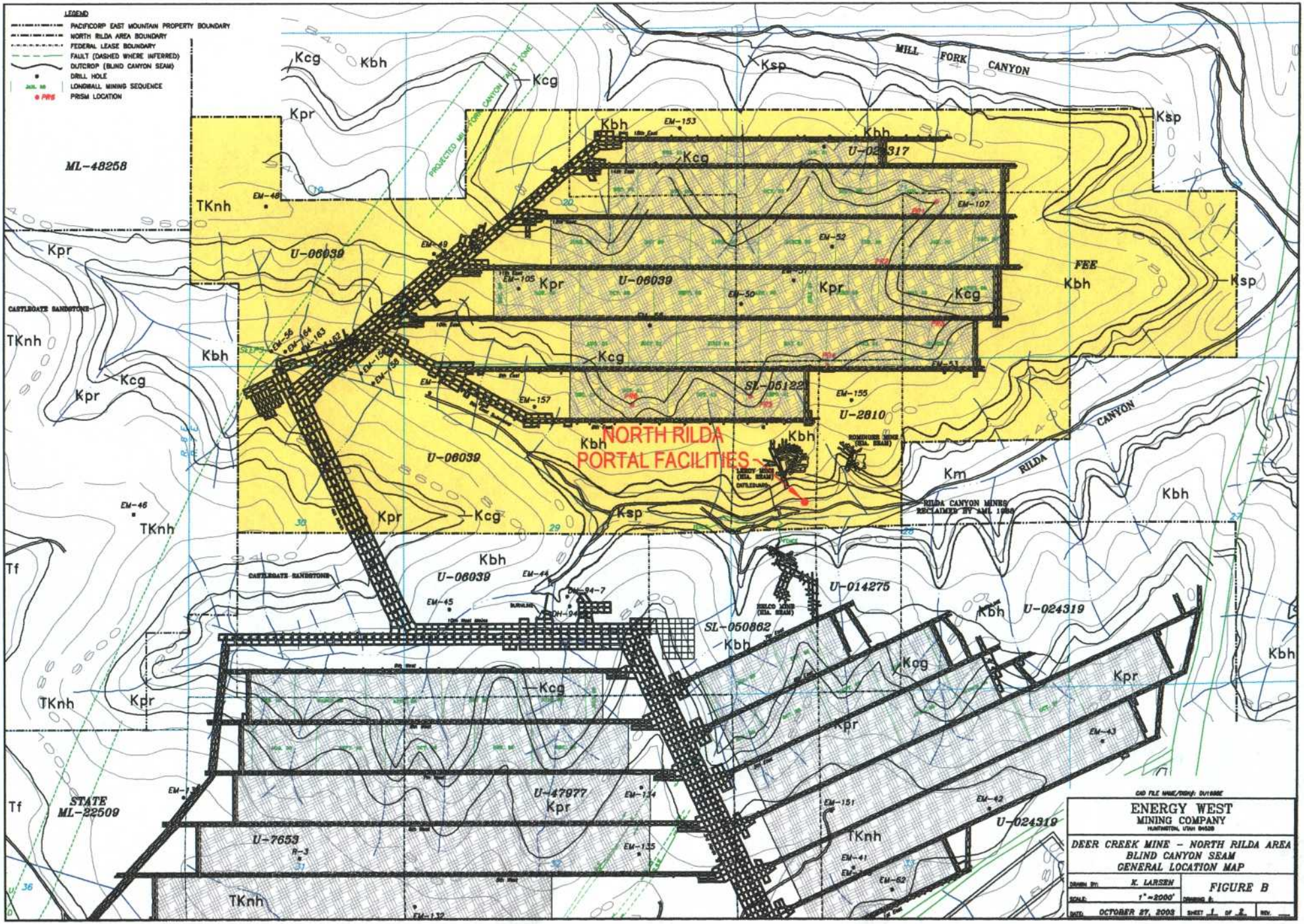
INTRODUCTION

In 1997 PacifiCorp received approval to expand its mining operations in Rilda Canyon (Refer to Figures A: Hiawatha Seam and Figure B:Blind Canyon Seam). This expansion involved increasing the size of the Deer Creek permit area by 1,960 acres. An additional 50 acres was added in 1998 upon completion of a lease modification to Federal Lease U-06039 (modification Number 2). In 2001, PacifiCorp applied and received approval to modify Federal Lease U-06039 for third time for an additional 65.7 acres (modification Number 3). Refer to Volume 1: Part 1 Legal and Financial Section for right-of-entry and permit boundary information.

Because of its northern location relative to the existing permit area and Rilda Canyon, the proposed new area of expansion is simply called the "North Rilda Area".

~~All disturbance to the North Rilda Area will be through underground mining activities. No surface disturbance is planned for the area. Additionally,~~ Mining expansion into the North Rilda Area was anticipated early in the permitting process. Because of this, the North Rilda Area was included in many of the baseline studies and on many of the mine permit maps i.e. geology, hydrology, soils, vegetation, land use, surface and subsurface ownership, and permit area maps. ~~Because the area has already been included in previous studies and maps, the permit application process to incorporate the expansion area into the permit area should be simplified.~~


LEGEND
PACIFICORP EAST MOUNTAIN PROPERTY BOUNDARY
NORTH RILDA AREA BOUNDARY
FEDERAL LEASE BOUNDARY
FAULT (DASHED WHERE INFERRED)
OUTCROP (BLIND CANYON SEAM)
DRILL HOLE
LONGWALL MINING SEQUENCE
PIRSM LOCATION
ML-48258
MILL FORK CANYON
PROJECTED MILL FORK CANYON FAULT ZONE
U-024317
U-06039
FEE
SL-051221
U-2810
NORTH RILDA
PORTAL FACILITIES
RILDA CANYON
RILDA CANYON MINES RECLAIMED BY APR. 1988
CASTLEGATE SANDSTONE
U-014275
U-024319
SL-050862
U-47977
U-7653
STATE ML-22509
Kcg
Kbh
Kpr
Ksp
Km
TKnh
Tf
EM-153
EM-154
EM-107
EM-52
EM-51
EM-105
EM-53
EM-156
EM-46
EM-44
EM-45
EM-43
EM-131
EM-134
EM-135
EM-151
EM-42
EM-41
EM-149
EM-62
EM-132
DH-94-7
DH-94-9
R-3
ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528
DEER CREEK MINE - NORTH RILDA AREA
HIAWATHA SEAM
GENERAL LOCATION MAP
DRAWN BY: K. LARSEN
FIGURE A
SCALE: 1"=2000'
DATE: OCTOBER 27, 2003
SHEET 1 OF 1
REV.


LEGEND
PACIFICORP EAST MOUNTAIN PROPERTY BOUNDARY
NORTH RILDA AREA BOUNDARY
FEDERAL LEASE BOUNDARY
FAULT (DASHED WHERE INFERRED)
OUTCROP (BLIND CANYON SEAM)
DRILL HOLE
LONGWALL MINING SEQUENCE
PRISM LOCATION
MILL FORK CANYON
RILDA CANYON
NORTH RILDA PORTAL FACILITIES
ML-48258
U-06039
U-024317
U-2810
SL-05122
U-014275
U-024319
SL-050862
U-47977
U-7653
STATE ML-22509
FEE
CASTLEGATE SANDSTONE
ENERGY WEST MINING COMPANY
DEER CREEK MINE - NORTH RILDA AREA
BLIND CANYON SEAM
GENERAL LOCATION MAP
K. LARSEN
1"=2000'
OCTOBER 27, 2003
FIGURE B

PacifiCorp successfully acquired the Mill Fork Lease and entered COAL MINING LEASE AND AGREEMENT with the State of Utah on April 1, 1999. The coal tract as described in the lease contains approximately 5,562.82 acres, more or less. With the leasing of the Mill Fork Tract in 1999, PacifiCorp controls through ownership and leasing certain fee coal lands together with assigned federal coal leases nearly 30,000 acres of contiguous minable property located in Emery County, Utah. PacifiCorp submitted an application to include the Mill Fork Lease within the Deer Creek Mine permit in November 2001. The application was approved on March 5, 2003. This expansion involved increasing the acreage of the Deer Creek permit by 5,562.82 acres. Because of the geographic location, the proposed new area of expansion is referred to as the "Mill Fork Permit Area", refer to Volume 12.

After the acquisition of the Mill Fork Lease, PacifiCorp investigated multiple alternatives to access the coal reserves located to the northwest of the North Rilda Area. The process has included:

- Application for lease modification to physically connect the Mill Fork tract (State Lease) to the existing federal leases controlled by PacifiCorp (submitted November 2001 [originally submitted as a right-of-way application in November 2000]). Federal Coal Lease U-06039 was modified to include an additional 65.7 acres to allow the boundaries of the federal lease to become contiguous with State Lease ML-48258 (approved December 14, 2001)
- Submission of Incidental Boundary Change application to Division of Oil, Gas & Mining to amend the Deer Creek permit to include the lease modification area (approved January 2001).
- Surface coal exploration programs have been conducted to evaluate the coal reserve characteristics (2000-2003).
- Mine plans have been developed based on results of the coal exploration programs. As outlined in Volume 12, access to the Mill Fork lease is accomplished through a set main entries developed in the Hiawatha seam driven in a westerly direction along the southern most lease boundary.
- PacifiCorp evaluated long term options to improve overall transportation and economic considerations.
    - Options investigated included:
        - Reserve acquisition of Crandall Canyon Mine
        - New portal facilities in Mill Fork Canyon
        - New portal facilities in Rilda Canyon
            - In-seam horizontal drilling was conducted to evaluate potential location of portal facilities.
- As a result of extensive investigation, PacifiCorp selected Rilda Canyon as the only viable option based on the following criteria:
    - Environmental Considerations

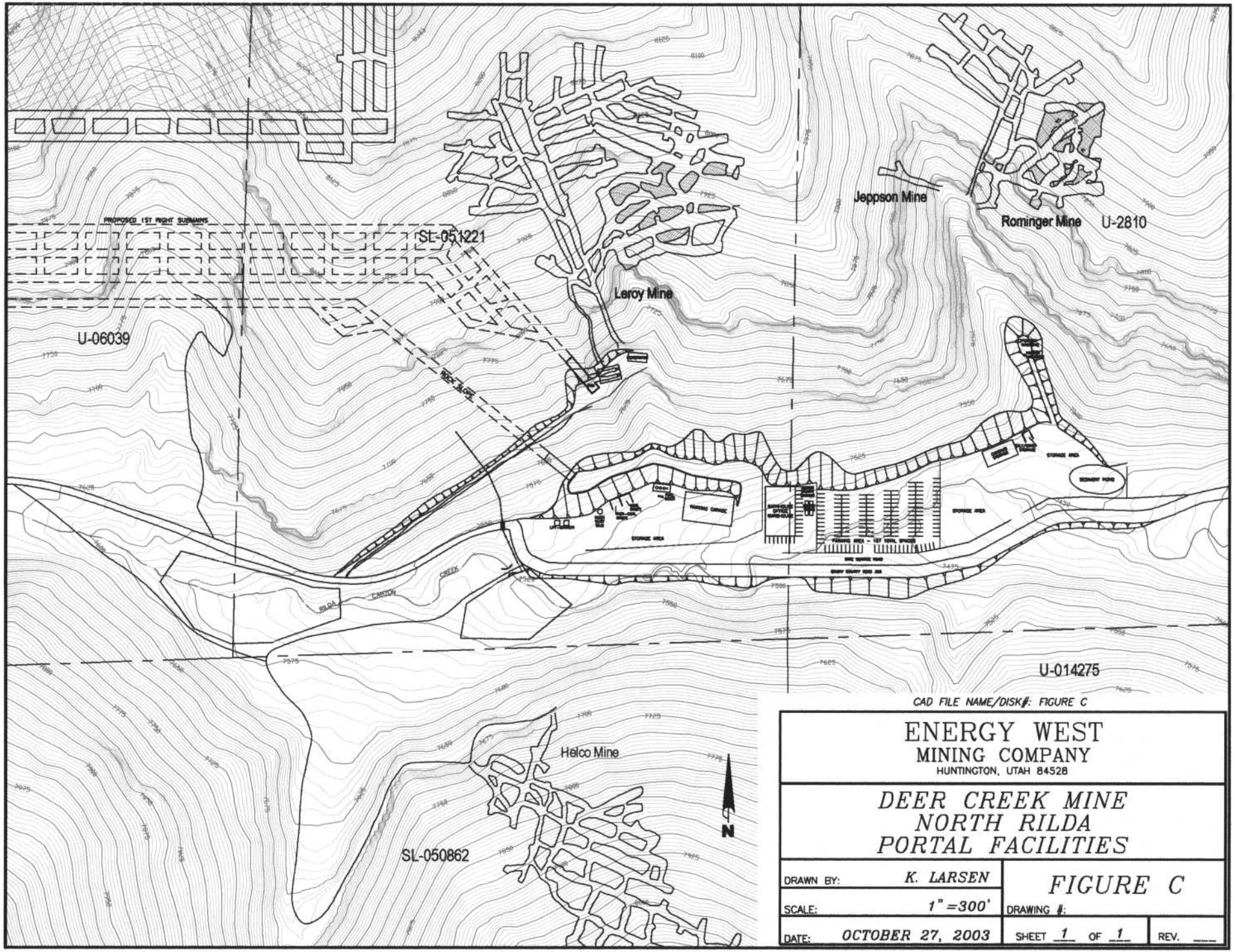
- Facilities are located in an area previously disturbed by mining
- Majority of the facilities are situated below the Rilda Canyon Springs
- Surface facilities are designed to accommodate men and materails (Refer to Figures C: North Rilda Canyon Portal Facility). Coal mined in the Hiawatha (lower) and Blind Canyon (upper) seams will continue to be shipped through the existing Deer Creek mine workings to the portal in Deer Creek Canyon. From this point, the coal will be transported to the Huntington Power Plant coal storage area via the existing overland beltline. Only surplus production beyond the Huntington Plant needs will be trucked on the highway from the plant.

○ Engineering
- Facilities designed to minimize surface disturbance
- Utilization of existing infrastructures (roads, powerline)

PERMIT ORGANIZATION

The following sections of this mining application pertain to all applicable coal mine permit application requirements of the Utah R645-Coal Mining Rules (revised May 1, 1998). Applicable sections herein include:

Introduction
R645-301-100. General Information
R645-301-200. Soils
R645-301-300. Biology
R645-301-400. Land Use and Air Quality
R645-301-500. Engineering
R645-301-600. Geology
R645-301-700. Hydrology
R645-301-800. Bonding



CAD FILE NAME/DISK#: FIGURE C

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
NORTH RILDA
PORTAL FACILITIES

DRAWN BY:	*K. LARSEN*	*FIGURE C*	
SCALE:	*1" =300'*	DRAWING #:	
DATE:	*OCTOBER 27, 2003*	SHEET 1 OF 1	REV. ___

R645-301-100 GENERAL SECTION

TABLE OF CONTENTS

R645-301-100	General Contents	1
R645-301-112	Identification of Interests	1
R645-301-113	Violation Information	1
R645-301-114	Right-of-Entry Information	1
R645-301-115	Status of Unsuitability Claims	1
R645-301-116	Permit Terms	1
R645-301-117	Insurance	2
R645-301-118	Filing Fee	4
R645-301-120	Permit Application Format and Contents	4
R645-301-130	Technical Information	4
R645-301-140	Maps and Plans	4
R645-301-150	Completeness	4

R645-301-100 GENERAL CONTENTS ~~(R645-301-100)~~

R645-301-112 IDENTIFICATION OF INTERESTS ~~(R645-301-112)~~

Pertinent names, addresses, and telephone numbers have been addressed ~~previously~~ in the Legal & Financial Volume Supplemental Volume~~Volume 1, Part 1 of the Mining & Reclamation Plan (MRP)~~.

R645-301-113 VIOLATION INFORMATION ~~(R645-301-113)~~

Violation information of the applicant has also been addressed ~~previously~~ in the Legal & Financial Volume Supplemental Volume~~Vol. 1, Part 1 of the MRP~~.

R645-301-114 RIGHT-OF-ENTRY INFORMATION ~~(R645-301-114)~~

Refer to the Legal & Financial Volume Supplemental Volume~~Volume 1: Part 1 Legal and Financial Section~~ for right-of-entry and permit boundary information.

R645-301-115 STATUS OF UNSUITABILITY CLAIMS (R645-301-115)

No information is on record to suggest the North Rilda Area has been designated unsuitable for mining and reclamation activities.

~~The proposed area will not~~ Coal mining and reclamation operations will not occur ~~be mined~~ within 300 feet of an occupied public dwelling ~~or within 100 feet of a public road.There are no known dwellings or road~~ within the North Rilda area.

Coal mining and reclamation operations related to the North Rilda Canyon Portal Facilities will be conducted within 100 feet of a public road (Emery County Road #306). PacifiCorp will comply with the regulations set forth in R645-103-234.

Buffer zones established for protection of riparian areas are addressed in the R645-301-500 Engineering Section. ~~of Volume 11.~~ and R645-301-731.600.

R645-301-116 PERMIT TERM ~~(R645-301-116)~~

R645-301-116.100
Mining in the North Rilda Permit Area will take place from the years 1997 through 2004. Mining began in the Blind Canyon seam in 1997 and was completed in 2001. Hiawatha seam

mining began in 2001 and will end in 2004. These time periods are consistent with the R_2P_2 (refer to Volume 5: Maps 3-6 and 3-7).. Blind Canyon seam mining affected approximately 856 acres. Mining in the Hiawatha seam will affect an additional 107.7 acres (includes Mill Fork Access Mains) outside the Blind Canyon affected area. A total of approximately 963.7 acres will be affected by mining in the North Rilda Permit Area.

R645-301-117 INSURANCE ~~(R645-301-117)~~

R645-301-117.100

The MRP for the Deer Creek Coal Mine contains a certificate of liability insurance in the Legal & Financial Volume Supplemental Volume.~~Volume Volume 1, Part 1.~~

R645-301-117.200

A copy of the newspaper advertisements (or proof of publication of the advertisements) of the significant revision will be filed with DOGM and will be made a part of the application not later than 4 weeks after the last date of publication as required by R645-300-121.100.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 22nd day of April,1997 and that the last publication of such notice was in the issue of such newspaper dated the 13th day of May, 1997.

Kevin Ashby

Kevin Ashby - Publisher

Subscribed and sworn to before me this 13th day of May,1997.

Linda Thayn

Notary Public My commission expries January 10, 1999 Residing at Price, Utah

Publication fee, $366.08

NOTARY PUBLIC
LINDA THAYN
511 NORTH 10TH EAST
PRICE

NOTICE

PacifiCorp, an Oregon Corporation, One Utah Center, 201 South Main, Salt Lake City, Utah 84140, hereby announces that an application to significantly revise the Deer Creek Mine Permit has been determined administratively complete by the Division of Oil, Gas & Mining. This revision involves the addition of approximately 1,960 acres of leased property to the Deer Creek Mine permit area.

A copy of the complete application is available for public inspection at the Emery County Recorder's Office, Emery County Courthouse, Castle Dale, Utah 84513.

Written comments on the application should be submitted to the Utah Coal Regulatory Program, State of Utah, Division of Oil, Gas and Mining, 1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, Utah 84114-5801. Said comments must be submitted within thirty (30) days from the date of last publication of this notice.

The area to be mined is contained on the USGS 7.5 minute "Rilda Canyon" quadrangle map. A map depicting the general area of the Deer Creek Mine is published herewith.

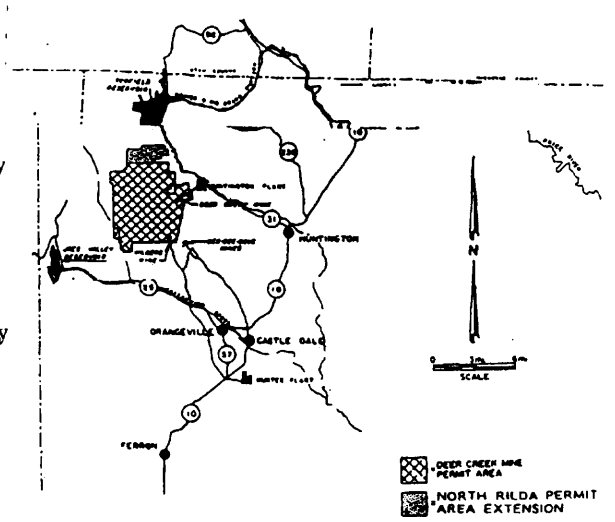
The Mine Permit Extension Area includes four (4) patent fee claims; three (3) complete Federal Coal Leases (U-024317, U-2810 and SL-051221; and the northern portion of Federal Coal Lease U-06039.

The extension area is more particularly described as follows:

Township 16 South, Range 7 East, SLM, Utah

Section 19	SE1/4
Section 20:	S1/2, S1/2 NE1/4
Section 21:	S1/2 NW1/4, S1/2 NE1/4, SW1/4, SE1/4
Section 22:	SW1/4 NW1/4, SW1/4
Section 30:	NE1/4
Section 29:	N1/2
Section 28:	NW1/4, N1/2 NE1/4

All together containing 1,960 acres, more or less.



Published in the Emery County Progress April 22, 29 and May 6 and 13, 1997.

R645-301-118 FILING FEE ~~(R645-301-118)~~

The filing fee to mine coal has previously been paid for by PacifiCorp.

R645-301-120 PERMIT APPLICATION FORMAT AND CONTENTS ~~(R645-301-120)~~

Format and contents are in accordance with requirements of the State of Utah, Department of Natural Resources, Division of Oil, Gas & Mining (DOGM).

R645-301-130 TECHNICAL INFORMATION ~~(R645-301-130)~~

This document has been prepared by *PACIFICORP* ~~and *MT. NEBO SCIENTIFIC, INC*~~. Attempts have been made to provide the names of persons or organizations that collected and analyzed all technical data submitted in the permit application including dates of the collection, analysis of the data, and descriptions of the methodology used to collect and analyze the data.

Technical analyses have been planned by or performed under the direction of a professional qualified in the subject to be analyzed.

R645-301-140 MAPS AND PLANS ~~(R645-301-140)~~

Maps submitted with permit applications have been presented in a consolidated format and include all the types of information that are set forth on U.S. Geological Survey maps of the 1:24,000 scale series. Maps of the permit area have been included at a scale of 1:6,000 or larger. Maps of the adjacent area clearly show the lands and waters within those areas.

All maps and plans submitted with the permit application distinguish among each of the phases during which coal mining and reclamation operations were or will be conducted at any place within the life of operations. At a minimum, distinctions have been clearly shown among those portions of the life of operations in which coal mining and reclamation operations occurred.

R645-301-150 COMPLETENESS ~~(R645-301-150)~~

Attempts have been made for the application to be complete and include, at a minimum, information required under R645-301 of the State Rules.

R645-301-200 SOILS SECTION

TABLE OF CONTENTS

R645-301-210 INTRODUCTION 1

R645-301-220 ENVIRONMENTAL DESCRIPTION 2

R645-301-230 OPERATION PLAN 3

R645-301-231 GENERAL REQUIREMENTS 3

R645-301-232 TOPSOIL REMOVAL 3
Left Fork Rilda Canyon Fan Facility 3
North Rilda Canyon Portal Facility 3

R645-301-234 TOPSOIL STORAGE 4

R645-301-240 RECLAMATION PLAN 4

LIST OF APPENDICES

Appendix A North Rilda Canyon Portal Facilities Soil Survey

LIST OF MAPS

2-1 North Rilda Canyon Portal Facilities Soil Sample Locations

R645-301-210 INTRODUCTION

~~No surface disturbance is expected within the boundaries of the North Rilda Area. Accordingly, it will not be necessary to remove or save topsoil, subsoil or substitute material for a final reclamation plan. Although the proposed expansion plan will have little effect on the existing soil resources, a short description of the soils in this area has nevertheless been provided.~~

Mining in the Rilda Canyon area has been conducted since the 1940's. Four historic mines (Helco Mine, Leroy Mine, Jeppson Mine, and Rominger Mine) are located in Rilda Canyon that were reclaimed by Abandoned Mined Lands in 1988. In 1995, PacifiCorp expanded its Deer Creek Mining operations into the North Rilda area. Approximately 23 million tons of minable coal is anticipated to be mined from the this area during life-of-mine production. Surface ventilation facilities were constructed in the Left Fork of Rilda Canyon to provide for ventilation to the North Fork area. Because of the need to expand the mining operations farther to the northeast (Mill Fork State Lease #48258), surface facilities are required in Rilda Canyon. This includes all support facilities for underground mining operations with the exclusion of coal transportation.

A soil survey was conducted in the Rilda Canyon area in 1991 and is detailed in the sections that follow. Soil segregation locations have been established in the Left Fork Rilda Canyon fan facilities area (refer Volume 4 Map 2-17A) and the North Rilda Canyon portal facilities area (refer to soils map in Appendix A). These areas store stripped topsoil from each of these disturbed areas. Topsoil from the historic mining areas has also been segregated and stored separately from the native topsoil.

The following sections detail investigations of the soil environment in Rilda Canyon. Through these investigations, detailed procedures are designed for the removal and storage, sampling, analysis, and replacement of soil during reclamation of the disturbed sites. Soils information for the Mill Fork Lease can be reviewed in Volume 12, Mill Fork Lease, ML48258, November, 2002.

R645-301-220 ENVIRONMENTAL DESCRIPTION

The soils in the area have been included in previous baseline studies of the general permit area. Furthermore, the soils of the area have been mapped previously by the operator in anticipation to include the area for future mining (see Volume 4, Map 2-16, "Future Permit Area"). A field survey of the soils of the permit area was conducted by T.H. Furst in 1990. Field work and laboratory analyses of Soil Pedon 3 in the study described and classified the soils mapped in the North Rilda Area. The soils have been classified as mixed Typic Cryoborolls, loamy-skeletal, 25-40% slopes. The pedon contained >0.6% organic carbon throughout the soil solum, and the percent base saturation was most likely >50% throughout the soil solum (inferred from the pH). Soil textures ranged from sandy loam in the A and Bw1 horizons to loam in the Bw2 horizon. Electrical conductivity ranged from 0.4-0.5 mmhos/cm and the sodium adsorption ratio for all horizons was less than 3.4. Soil reaction (pH) ranged from 8.0 to 8.1. SAR values were also low enough to be rated as "good" by DOGM guidelines. Alkalinity (HCO3) was less than 4 meq/L, whereas, the saturation percentages of all horizons ranged from 44.6% to 52.6%. Available water capacity ranged from 0.10 to 0.15 inches of water per inch (depth) of soil. Calculations of the total available water revealed that about 3.6 inches of water would be available on a whole pedon basis when the displacement of soil material by coarse fragments was taken into account.

The soils were generally described "as a dark grayish brown loamy surface layer about 40 cm thick, underlain by a pale brown clay subsoil 40 cm thick, over a light gray calcareous substratum with up to 50% sandstone fragments". A general soil map for the permit area which includes the North Rilda Area has been provided as Volume 4, Map 2-16 in the Deer Creek MRP. For additional information about the soils in the area refer to Volume 1, Part 2 of the MRP.

R645-301-230 OPERATION PLAN

~~Because no surface disturbance will result from underground mining expansion into the North Rilda Area, an operation plan identifying soil handling and storage procedures is not necessary for the permit application process.~~

The following sections describe the methods for the removal and storage of topsoil from the Left Fork Rilda Canyon fan facilities and North Rilda Canyon portal facilities.

R645-301-231 GENERAL REQUIREMENTS

All areas to be disturbed at any time during the construction, operation, or reclamation of the mine and its surface facilities will have the available topsoil (i.e. plant growth medium) separately removed and segregated from other fill material. This material will be stockpiled for used during reclamation.

R645-301-232 TOPSOIL REMOVAL

Left Fork Rilda Canyon Fan Facility - Prior to surface facility construction, approximately 3,740 cubic yards of topsoil material were removed from the construction sites and placed in a storage area within the permit area, adjacent to the access road (refer Volume 4 Map 2-17A). Prior to topsoil removal, vegetation was removed as directed by the surface management agency. Only major vegetation types were removed. Topsoil was stripped to the depths indicated on Map 2-17A, using conventional earth moving equipment. Removal depths were based on the soil survey information. Removal depths were confirmed in the field by visual observations of the soil material and standard survey practices.

North Rilda Canyon Portal Facility - Prior to the removal of the topsoil, all trees and brush will be cleared. Soil will be stripped to various depths depending on soil type and/or topsoil depth. Where thick deposits of topsoil or material from reclaimed AML sites are found, as much soil material as possible will be removed. Only deposits located in areas which would be disturbed for other reasons will be utilized.

The proposed volume of native topsoil to be stripped is approximately 8,551 c.y. The proposed volume of soil material from reclaimed AML sites to be stripped is approximately 7,905 c.y. Total segregated topsoil to be stored is approximately 16,456 c.y. This is estimated using a 1.0 foot average depth for stripping. The proposed soil values are based on the preliminary design, final estimates will be determined upon completion of the geotechnical analysis and the final surface facility design.

Prior to any surface disturbance of the portal area soil test pits were dug. Soil test pits were established in both the proposed disturbed area and undisturbed area. These area included the pinon/juniper habitat areas, riparian habitat areas, mountain brush habitat areas, and AML reclaimed sites. Refer to Map 2-1 for test pit site locations. Samples were taken at various depth intervals and analyzed according to the *Guidelines for Management of Topsoil and Overburded for Underground and Surface Coal Mining* (Leatherwood and Duce, 1988). Analyses of these pre-construction samples are found in Appendix A.

R645-301-234 TOPSOIL STORAGE

The permanent stockpile of topsoil, for use during final reclamation, will be placed on a stable surface within the permit area where it will not be subject to significant disturbance, wind erosion, or compaction during life of mine. The stockpile locations are presented as follows:

Left Fork Fan Facilities:	Refer to Map 3-9A in Volume 5
North Rilda Canyon Portal Facilities:	Refer to R645-301-500 Map 5-2

Revegetation of the topsoil storage piles will be with an effective cover of non-noxious quick growing annual and perennial plants. The stockpile will not be disturbed prior to final topsoil redistribution without prior approval by the Division.

R645-301-240 RECLAMATION PLAN

~~Because no surface disturbance will result from expansion into the North Rilda Area, a reclamation plan is not necessary.~~

The reclamation plan will be included as more information is available.

R645-301-200 SOILS SECTION

APPENDIX A
SOIL SAMPLE ANALYSIS

♦ **PRE-CONSTRUCTION TEST PIT SAMPLES**

R645-301-200 SOILS SECTION

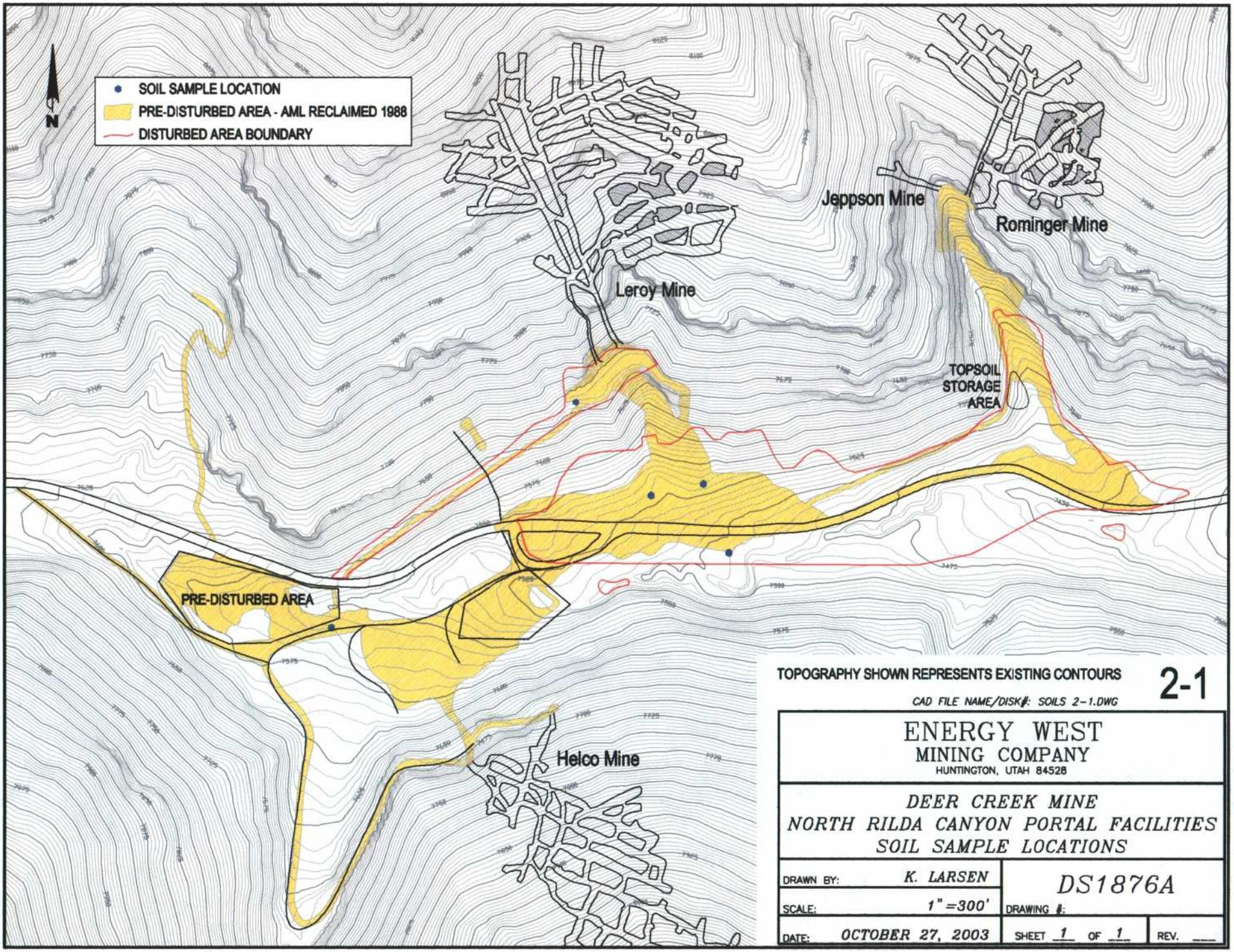
APPENDIX A

PacifiCorp contracted EIS Environmental Engineering and Engineering Consultants to conduct a soil survey of the proposed North Rilda Canyon Portal Facilities. The survey was conducted during September 2003 and included developing a series of test pits based upon input of the Divisions' soil specialist. PacifiCorp will prepare a soil stripping plan based upon the recommendation of the soil consultant. Findings of the soil survey will be included as Appendix A when available.

R645-301-200 SOILS SECTION

MAPS

♦ **MAP 2-1: SOIL SAMPLE LOCATION MAP**



TOPOGRAPHY SHOWN REPRESENTS EXISTING CONTOURS

2-1

CAD FILE NAME/DISK#: SOILS 2-1.DWG

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
NORTH RILDA CANYON PORTAL FACILITIES
SOIL SAMPLE LOCATIONS

DRAWN BY:	K. LARSEN	DS1876A	
SCALE:	1" =300'	DRAWING #:	
DATE:	OCTOBER 27, 2003	SHEET 1 OF 1	REV. ___

R645-301-300 BIOLOGY SECTION

TABLE OF CONTENTS

R645-301-300 BIOLOGY 1
R645-301-310 INTRODUCTION 1
R645-301-320 ENVIRONMENTAL DESCRIPTIONS 1
R645-301-321 VEGETATION INFORMATION 1
R645-301-322 FISH AND WILDLIFE INFORMATION 2
R645-301-323 MAPS AND AERIAL PHOTOGRAPHS 6
R645-301-330 OPERATION PLAN 6
R645-301-340 RECLAMATION PLAN 8
R645-301-341 REVEGETATION 8
R645-301-342 FISH AND WILDLIFE 11
R645-301-350 PERFORMANCE STANDARDS 13

REFERENCES:

Danielson, T.W.; Remillard, M.D.; Fuller, R.H., Hydrology of the Coal- Resource areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah; U.S. Geological Survey-Water Resource Investigations, Open-File Report 81-539.

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

MAPS:

3-1 VEGETATION MAP

APPENDICES:

A. North Rilda Lease Area Vegetation Survey and Evaluation, September, 1997, by Patricia K. Johnston.
B. North Rilda Canyon Portal Facilities Area Vegetation Survey, 2003, Mt. Nebo Scientific, Inc.
C. 2003 Raptor Survey and Map 2-18B

R645-301-300 BIOLOGY ~~(R645-301-300)~~

R645-301-310 INTRODUCTION

The following vegetative, fish, and wildlife resource information has been taken from the Data Adequacy document (Data Adequacy L.B.A No. 11, December 1996) and the Environmental Assessment (Mill Fork Federal Coal Lease Tract UTU-71307, Environmental Assessement document, Lease By Application, No. 11) reported by the Manti LaSal National Forest in June, 1997.

R645-301-320 ENVIRONMENTAL DESCRIPTIONS

R645-301-321 VEGETATION INFORMATION

The North Rilda area is located within an east-west trending canyon that is very steep and narrow with rounded narrow ridge tops. Contour elevations range from approximately 7400 feet to over 9,600 feet. Vegetative cover and species composition within this elevation range is very diversified. Ecosystems within this portion of East Mountain contain various habitats that are mostly influenced by the steep and broken slopes and their orientations. Distinguishable plant communities within the area are: Pinyon/Juniper, Mountain Brush, Mixed Conifer (upper elevations), and Riparian. A very narrow band of Riparian community is considered to follow along the stream to the Rilda Canyon Springs. Refer to Map 3-1 of this section for the diverse vegetative communities.

Vegetation studies have been conducted within the Deer Creek Mine permit area. The vegetation mapping that was previously ~~done~~ conducted for the mine area includes the North Rilda Area, (formerly called the "Future Permit Area" [Volume 4, Map 2-14]). ~~The principal plant communities of the North Rilda Area are Mixed Conifer and Pinyon-Juniper.~~ Vegetation studies were conducted for the North Rilda permit area by Patricia K. Johnston, September, 1997 (see Appendix A), Mt. Nebo Scientific, fall of 2003 (see Appendix B), and J.R. Barker in 1982 (Volume 3, Appendix II of the MRP). Quantitative and qualitative data of the major plant communities provided in the 1982 study are also relevant to the North Rilda Area.

Mr. Rick Collins, Mt. Nebo Scientific, identified different vegetation communities in the North Rilda Canyon portal facilities area and designated reference areas for each community. The pre-disturbed area was included as one of the reference areas, to establish standards for reclamation in these areas.

The most dominant plant community in the facilities area is the Pinion /Juniper/Mountain Brush

Transition. The prominent species identified in this area are: Utah Juniper (*Juniperus osteosperma*), Rocky Mountain Juniper (*Juniperus scopulorum*), Pinion Pine (*Pinus edulis*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), Ponderosa Pine (*Pinus ponderosa*), Big Sage (*Artemisia tridentata*), Salina Wildrye (*Elymus salina*), Indian Rice Grass (*Oryzopsis hymenoides*), Cutler ephedra (*Ephedra cutleri*), corymbed eriogonum, and bluebunch wheatgrass.

The Mixed Conifer community is found in the upper elevations of the canyon. The most common plant species of the Mixed Conifer community ~~were~~ are: Douglas fir (*Pseudotsuga menziesii*), Saskatoon serviceberry (*Amalanchier alnifolia*), corymbed eriogonum (*Eriogonum corymbosum*) and bluebunch wheatgrass (*Elymus spicatus*). ~~Common plant species of the Pinyon-Juniper community are: Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*),Cutler ephedra (*Ephedra cutleri*), corymbed eriogonum, and bluebunch wheatgrass.~~

Quantitative data of these communities sampled within the approved permit area and reference areas have been presented previously in the Deer Creek MRP (Volume 1, Part 2).

Threatened, Endangered and Sensitive Plant Species

Threatened, endangered, and sensitive plant species of interest include *Astragalus monti, Hedysarum occidentale var. canone, Silene petersonii, and Aquilegia flavescens*. Populations of these species have been found to inhabit the upper areas near the North Rilda Canyon portal facilities area. More information on these species, and other listed rare and high interest plant species are in the MRP Volume 12, Biology Section.

The Vegetation Survey and Evaluation, done in the North Rilda Canyon area by Patricia K. Johnston, indicates that no threatened, endangered and sensitive plants were found. This survey included extensive hiking of the area. It was also Mr. Bob Thompson's opinion, Botanist, Manti-LaSal National Forest, that impacts to vegetation due to mining induced subsidence will be negligible to vegetation.

R645-301-322 FISH AND WILDLIFE INFORMATION

The North Rilda Canyon portal facilities are all inclusive in the Rilda Canyon drainage. Rilda Canyon is a tributary to Huntington Creek.

Water resources provides habitat for a variety of big and small game animals, non-game animals and birds. A complete listing of all theatened and endangered wildlife species that have the potential to be present near and/or within the North Rilda Canyon can be found in the County lists of Utah's Federally Listed Species (UDWR, 8/14/02, at http://www.utahcdc.usu.edu/ucdc/.

A complete listing of all wildlife species that have the potential to be present near and/or within the Rilda Canyon can be found at this same internet address.

I. Aquatic Species - The Utah Division of Wildlife Resources (UT DWR) has conducted game aquatic surveys of the perennial and intermittent streams in the area. The following information, summarizes the representative game species in the Right Fork Rilda Creek.

Benthic Invertebrates - The USGS in cooperation with the Utah DNR and Utah DOGM conducted a comprehensive hydrologic study (from July 1977 through September 1980) of the upper drainages of the Huntington and Cottonwood Creeks ("Hydrology of the Coal-Resource Areas in the Upper Drainages of Huntington and Cottonwood Creeks"). Data on benthic invertebrates were collected from 16 sites in October 1977, July and October 1978, and October 1979. This data will be cited and used as a baseline evaluation for the North Rilda Canyon area. Refer to United States Geological Survey, Water-Resource Investigations, Open-File Report 81-539, Salt Lake City, Utah, 1981.

As written from the report, "...data indicate that there were significant seasonal differences in the benthic invertebrate population at a given site in addition to areal differences...These organisms appeared in their maximum numbers in the July samples collected at sites in the higher altitudes of the study area, but they were not present in any of the October samples. The large numbers found in July, reflected a seasonal cycle rather than an unnatural condition that allowed one species to dominate." The average diversity (Shannon-Weiner diversity index) found between 1977 and 1979 in Rilda Canyon was 2.84.

~~FISH & WILDLIFE~~

II. Terrestrial Species - Wildlife studies have been conducted within the Deer Creek Mine permit areas and those areas adjacent to it. The wildlife habitats of the North Rilda Area include Mixed Conifer and Pinyon-Juniper ~~and probably some riparian~~ communities. Descriptions of these and other habitats that exist within the permit boundaries have been given in previous wildlife sections of the MRP. "Species of Special Significance", threatened, endangered, and "Special Status Species" have been described previously. Table 1 of Volume 1, Part 2 of the MRP lists Vertebrate Species of the Wasatch Plateau of which the Deer Creek Mine permit area and the North Rilda Area are part. The tables include the species status (common, rare, threatened, etc.), the habitats in which they occur, and the likelihood of their occurrence within the boundaries of the lease area.

Mule deer and Elk habitats have been mapped for the permit and adjacent areas, part of which are within the North Rilda Area boundaries (Volume 4, Map 2-19). Neither "Critical Deer Winter

Range", nor "High Priority Deer Winter Range" exist in the North Rilda Area. Instead, the area is mapped as "High Priority Summer Habitat" (Volume 4, Map 2-19).

Raptor nesting studies and nest mapping have been conducted in the North Rilda Area. Much of the area is raptor nesting habitat. Specific nests have been numbered and mapped in the area (see ~~Biology Section~~ R645-301-300 Appendix C). The status of the~~se~~ two nests in Rilda Canyon have also been included (see ~~Biology Section~~ R645-301-300 Appendix C). Nest information and locations are based on results from the ~~1996~~ 2003 annual raptor survey conducted by Energy West Mining Co. , in conjunction with the Utah Department of Wildlife Resources. Energy West Mining Co. will conduct annual raptor surveys in the area. The results of those surveys will be available upon request.

~~Due to the potential for Townsends Big-eared bats and Spotted bats to occur along the cliff escarpment in Rilda Canyon, a bat survey of the areas of potential failure will be conducted to determine the presence of these mammals.~~

R645-301-322.210 THREATENED AND ENDANGERED SPECIES

The Environmental Assessment (Mill Fork Federal Coal Lease Tract UTU-71307, Environmental Assessment, LBA Application #11. June, 1997), MRP Volume 12 reports "No threatened or endangered wildlife species are known to inhabit the proposed lease area. A Bald Eagles (*Haliaeetus leucocephalus)* nest near the Hunter Power Plant is approximately 26 miles southeast of the coal lease. The coal lease area is outside of the foraging area for the Bald Eagles. Two peregrine falcons (*Falco peregrinus*) were observed approximately 13 miles north in 1996. The falcons were observed during nesting season but no nest site was ever confirmed. It is generally accepted that peregrine falcons will forage up to 15 miles from their eyrie, however given the prey base available it is doubtful that the falcons would forage over the coal lease area. No roost sites have been found in the lease area ..."

Mexican Spotted Owls (MSO) have recently become a species of interest since the U.S. Fish and Wildlife Service (USFWS) designated (in January, 2001) 4.6 million acres on federal lands in Arizona, Colorado, New Mexico, and Utah as critical habitat. The designation includes 3.2 million acres in Utah. More specifically, the designation includes areas west of the Colorado River within the West Tavaputs Plateau in Carbon County and the northeast corner of Emery County east of US Highway 6. Other areas in Utah have been designated as critical habitat, however, these areas exist in the southern portion of the state. Typical MSO, habitat according to the 2001 Environment Assessment, consists of "a diverse array of biotic communities. Nesting habitat is typically in areas with a complex forest structure or rocky canyons, and contains uneven-aged, multi-storied mature or old growth stands that have high canopy closure (Ganey

and Balda 1989, USDI 1991). In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons....typically characterized by the cooler conditions...frequently contain small clumps or stringers of ponderosa pine, Douglas fir, white fir, and/or pinion-juniper".

Dr. Dave Willey from Montana State University, known Mexican Spotted Owl expert, modeled representative habitat using the 2000 Willey-Spotskey Mexican Spotted Owl Habitat Model. The model included the Manti LaSalle area. Figure 1 includes the North Rilda Canyon area, with the Mill Fork Lease area drawn. Areas identified in black, are areas of potential nesting habitat. The green's are identified as potential foraging areas of steep sloped mixed conifers. However, it is reported in the DWR's *Inventory of Sensitive Species and Ecosystems in Utah, 1997* that foraging, nesting and roosting habitats are "dominated by Douglas-fir and/or white fir...In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff

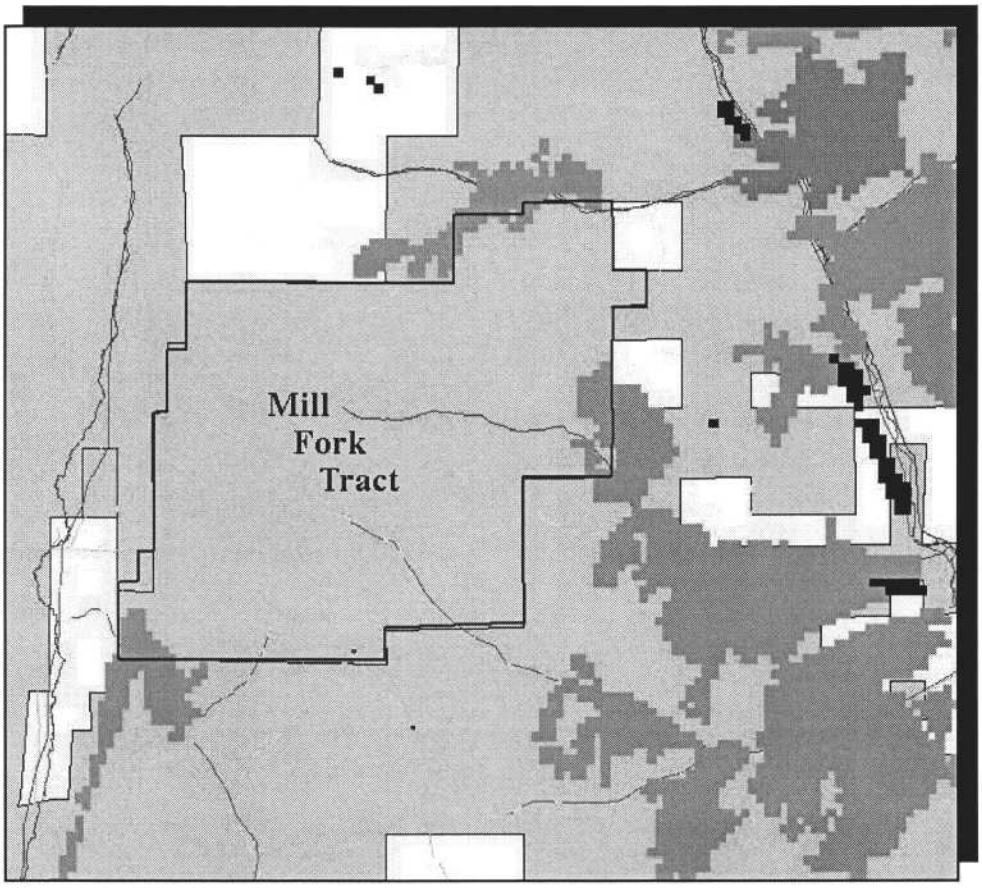


Figure 1: Mexican Spotted Owl nesting and foraging areas (Dr. Dave Willey, Montana State University, 2000).

ledges in steep-walled canyons." Potential steep sloped, mixed conifer foraging habitats of this type are found on the extreme northeastern border, extreme western border, and a small area in the southwest corner of the Millfork lease area as illustrated in Figure 1. Large ponderosa pines are typically found in lower elevations in the rocky canyons. The Rilda Canyon drainage is depicted in the lower right corner of Figure 1. The Rilda Canyon supports both aspen and Douglas fir stands, and has cliff ledges or steep walled canyons recognized as typical nesting habitats.

No sitings of the Mexican Spotted Owl have been made on the Mill Fork Lease Area (personnel communication with Rod Player, USFS - Price District). Areas west of the San Rafael have been surveyed two years in a row and no owls were found (Mexican Spotted Owl Training Class, Lora Romin, Frank Howell - DWR Instructor, March 21, 2002, Moab, Utah). It is PacifiCorp's opinion that with the facts given, mining will have no effect on the Mexican Spotted Owl if they occur in the lease area.

~~No surface disturbance has been proposed in the North Rilda Area, therefore no disturbance will be conducted to the plant communities (including potential sensitive, threatened or endangered species) that exist within its boundaries.~~

R645-301-323 MAPS AND AERIAL PHOTOGRAPHS

The map for vegetation diversity is located in the Maps Section of R645-301-300, Biology, of this volume. Deer and elk habitat, and raptor nest locations are included in the Maps Section of the Mine MRP. The reader should review these maps to locate these environmental resource items of interest. In addition to biologic base maps provided in this section, PacifiCorp conducts annual reconnaissance surveys, including subsidence monitoring (annual aerial photogrammetric surveys), infrared photography (5 year intervals), and hydrologic monitoring.

R645-301-330 OPERATION PLAN

As depicted on drawing R645-301-500 Map 5-2, the North Rilda Canyon portal facilities are mostly within pre-disturbed land. The facilities are on much of the same land as the old Leroy and Rominger Mines. Both mines were reclaimed by AML in 1988. The old mine sites disturbed a total of 10.67 acres and the total disturbed ground for the North Rilda Canyon portal facilities is 10.2 acres. Of the 10.2 total disturbed acres, 4.9 acres are on land pre-disturbed by the old mine workings. The pre-disturbed land is 48% of the total disturbed at the North Rilda Canyon Portal Facilities.

A brief summary of the facilities are: Undisturbed bypass culvert, bathhouse and office buildings,

parking lot, underground vehicle parking garage, fueling area, trash bunker, rock dust silo, septic tanks and sewer pump station, salt storage, non-coal waste storage, sediment pond, fan, generator, fan access road, and some designated storage areas. Steep slopes, created for construction of the facilities will be supported using geotechnical design criteria.

To minimize impact to the stream area, where the undisturbed bypass culvert is installed, a fabric liner will be installed in the existing stream bed. No top soil will be removed from this area. This will allow the operator to reclaim the stream in the original location. Buffer zones, up stream and down stream of the bypass culvert, are established and marked with "Buffer Zone" signs to minimize potential impacts to the stream.

To protect the vegetative growth media, the topsoil will be removed prior to construction of the facilities. The top soil storage area is designated on R645-301-500 Map 5-2. Erosion protection includes interim vegetation and silt fence, until the vegetation is established. A "topsoil" sign will place at the foot of the topsoil pile slope for location awareness.

Erosion control is discussed in the engineering and hydrology section of the this volume.

Second mining, ie. longwall extraction, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4th North Mains development within the Right Fork of Rilda and the long-term stability analysis refer to the Engineering Section R645-301-500 Appendix 1. To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

~~No surface disturbance has been proposed to the wildlife habitats in the North Rilda Area, therefore little or no influence on the proposed new permit area is expected.~~

R645-301-340 RECLAMATION PLAN

R645-301-341 REVEGETATION

Table 3-1 discloses the timetable in which reclamation will be conducted on North Rilda Canyon portal facilities. Much of the operations will be conducted simultaneously. The main emphasis of reclamation will work from the top of the canyon to the bottom.

Table 3-2 establishes a monitoring program that extends through the responsibility period of the bond.

Table 3-1: North Rilda Canyon Portal Facilities Reclamation Schedule: Initial Reclamation for mine facilities.

#	Project	Estimated Scheduling *
1	Soil Sampling (2001/2002)	Sampling conducted between the months of June - October.
2	Structure Removal	
3	Closures – Portals & Ventilation*	
4	Soil Salvaging	
5	Hauling, Backfilling, Compaction & Grading	
6	Install Riprap Channels	
7	Seed Bed Preparation	
8	Fertilization & Mulching	
9	Seeding & Planting	
10	Sediment Control Structure Removal **	

* After reclamation plan approval, a reclamation cost estimate will be developed that will give an accurate time duration of each project listed.
** The sediment pond will be removed at the completion of all other reclamation activities above pond.

Notice in the table above that backfill and grading activities and seeding activities are occurring simultaneously. This will occur as work progresses down canyons. Advantageously, seeding will occur during the fall season. However, if recontouring is completed in the spring of the year on the upper portions of the disturbed area, seeding will follow. Live tree and shrub plantings will occur in early spring.

Table 3-2: Deer Creek Coal Mine Reclamation Schedule: 1st thru 10th Year.

#	10 Year Revegetation & Monitoring	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year
1	Plant Monitoring Disease & Pest Control *		✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔
3	Soil Stabilization Rills & Gullies		✔	✔	✔	✔	✔	✔	✔	✔	✔
4	Contingent Seeding		✔			✔					
5	Revegetation Inventory for Bond Release				✔				✔	✔	✔

* Monitoring is conducted twice per year during the spring and fall.

Description of Revegetation Operations

In tables 3-3 and 3-4, seed mixes have been established for three areas of disturbance; Pinyon Juniper and Riparian habitats. Pinyon Juniper habitats are those areas that have a high exposure to sunlight. These areas are typically drier and need grass growth early on for moisture retention and soil stabilization.

Table 3-3: Seed Mixture (Pinyon-Juniper)

Common Name	Scientific Name	Lbs/Acre Equivalent PLS*
Grasses		
Bluebunch Wheatgrass	Agropyron spicatum	1.0
Big Bluegrass	Poa ampla	0.5
Great Basin Wild Rye	Leymus cinereus	2.0
Indian Ricegrass	Oryzopsis hymenoides var. Paloma	3.0
Thickspike Wheatgrass	Agropyron dasystachyum var. Critana	2.0
Western Wheatgrass	Agropyron smithii var. Rosanna	3.0
Forbes		
Blueleaf Aster	Aster glaucodes	0.5
Blue Flax	Linum lewisii	1.0
Louisiana Sage	Artemisia ludoviciana	0.2
Northern Sweetvetch	Hedysarum boreale	1.0
Palmer Penstemon	Penstemon palmeri	0.5
Shrubs		
Big Sagbrush	Artemisia tridentata var. wyomingensis	0.5
Curleaf Mahogany	Cercocarpus ledifolius	2.0
Fourwing Saltbush	Atriplex canescens	3.0
Saskatoon Serviceberry	Amelanchier alnifolia	1.0
Whitestem Rubber Rabbitbrush	Chrysothamnus nauseosus	0.2

Riparian areas are seeded to encourage forb and shrub growth, which supplies a good food source and cover for wildlife. These areas usually have a sufficient water supply for competent plant growth. The riparian seedmix will be used only in the reclaimed stream bed.

Table 3-4: Seed Mixture (Riparian)*

Common Name	Scientific Name	Lbs/Acre Equivalent PLS*
Grasses		
Indian Ricegrass	Oryzopsis hymenoides var. Paloma	2.0
Kentucky Bluegrass	Poa pratensis	1.0
Mountain Brome	Bromus marginatus	2.0
Needle and Thread Grass	Stipa comata	1.0
Streambank Wheatgrass	Agropyron riparium var. Sodar	3.0
Forbs		
Blueleaf Aster	Aster glaucodes	0.2
Louisiana Sage	Artemisia ludoviciana	0.2
Rocky Mountain Penstemon	Penstemon strictus	1.0
Silky Lupine	Lupinus sericeus	3.0
White Yarrow	Achillea millefolium	0.1
Shrubs**		
Saskatoon Serviceberry	Amelanchier alnifolia	1.0
Rocky Mountain Maple (C) or (B)	Acer glabrum	300/acre within 20 ft of stream
Woods Rose (C) or (B)	Rosa woodsii	200/acre within 20 ft of stream
Trees**		
Coyote Willow (X) or (RX)	Salix exigua	One foot spacing
Red Osier Dogwood (X) or (RX)	Cornus stolonifera	Five foot spacing
Narrowleaf Cottonwood (C) or (P)	Populus angustifolia	Ten foot spacing

* (C) = Containerized plants (B) = Bare root plants (X) = Cuttings (RX) = Rooted cuttings (P) = Poles
** 25% of live Trees and Shrubs will be planted yearly up to the 4th year. Planting will take place in early spring between the months of March and April.

Seeding Techniques

Seeding will take place as contemporaneously as practical following soil placement and contouring/pocking of the area being reclaimed. Certified noxious weed free alfalfa hay will be incorporated into the soil following contouring at a rate of 2000lbs/acre. Pocking techniques will mix the alfalfa hay into the upper portion of the soil.

The seed mixture will be broadcast using a "hurricane spreader" or applied using a hydroseeder. If the seed mixture is hydroseeded, a small amount of wood fiber mulch will be added to mark

the area of coverage during application.

Next, a certified noxious weed-free straw or hay mulch will be applied at a rate of 2000lbs/acre. If possible, the mulch will be applied using a tub grinder or similar blower. A tackifier (plantago or other similar tackifier) will be applied at a rate of 500 lbs/ac to cover the mulch and stabilize the soil. Mulch and tackifier will be applied as contemporaneously as possible.

Riparian seed mixtures will be applied to an area that is within the reestablished drainage, while Pinyon-Juniper seed mixtures will be applied to all other areas of the reclamation site.

Measures to determine success of revegetation are those included in R645-301-350 of the Utah Coal Rules and as detailed later in this section.

R645-301-342 FISH AND WILDLIFE

To minimize impact of the stream area, where the undisturbed bypass culvert is installed, a fabric liner will be installed in the existing stream bed. No top soil will be removed from this area. This will allow the operator to reclaim the stream in the original location. Buffer zones, up stream and down stream of the bypass culvert, are established and marked with "Buffer Zone" signs to minimize potential impacts to the stream.

The channel bank in these areas will be protected primarily with vegetation. In transition areas of the channel (e.g. from a 10% slope to a 2% slope), the bank will be heavily armored.

Shrubs within the riparian area were chosen to provide cover and forage for wildlife. They will be hand planted using a shovel. Care will be taken not to damage the root structures of bare rooted plants. Containerized plants will be planted similarly. During the first year of reclamation, 25% of the total trees and shrubs will be planted during early months of spring. Each year, an additional 25% will be planted (in spring) until 100% of all trees and shrubs have been planted. The trees and shrubs will be planted randomly in areas that have adequate moisture or moisture collecting features. Monitoring will be performed throughout each year to track the success or failure of the plantings. Planting and/or fertilization procedures may change periodically to improve success rates in order to achieve bond release.

The riparian seed mix will be used as mentioned in Table 3-4 to provide a riparian habitat along the stream banks for wildlife cover and food.

R645-301-350 PERFORMANCE STANDARDS

Signs will be placed around the planted slopes for there protection. The area will be entered only to provide maintenance (as needed) and/or monitoring duties.

Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate of succession. All noxious weeds will be eradicated either chemically or physically if they become established on the site.

Rodent damage on revegetated areas will be assessed during monitoring periods. Species specific control measures will be implemented as necessary.

Annual monitoring will also include inspection for rills and gullies. Should these be present, they will be filled and the soil reseeded. Rill and gully repair will follow the regulations set forth in the Coal Rules R645-301-357.360 through R645-301-357.365. As repairs are recognized, the Division will be notified and the affected area will be reported in the annual vegetation report.

All vegetation sampling will be undertaken in the late summer for maximum plant growth. The line intercept or ocular estimation methods will be used to measure cover and species composition. The point-center quarter method will be used to measure shrub and tree density.

Productivity measurements will be a double sampling procedure of clipped plots and ocular estimates. Rectangular plots (6.27 in. x 100 in.) will be randomly located in reference areas and revegetation sites. Sampling will be at the 90% confidence level.

The reference area will be checked to detect any change from natural or man-induced activities and to verify they are in fair or better condition. Sampling of the reference sites at the time of bond release will be conducted concurrently with final reclamation sampling, using the same methodology used to sample the reclaimed areas.

The standards for success to be applied for ground cover and production of living plants on the reclaimed areas at the North Rilda Canyon Portal Facilities will be at least equal to 90% (with a 90% confidence level) to that of the respective reference area at the time of bond release. For example, the reclaimed riparian area will be compared to the riparian reference area for cover and production. Cover in the reclaimed areas will not be less than that required to achieve the approved post-mining land use outlined in R645-301-400: Land Use and Air Quality.

Revegetation for tree and shrub species will be considered successful when the tree and shrub count in the reclaimed areas are similar at the time of bond release to the count in the reference area.

During the 4th year after revegetation, the point-quarter or other accepted method will again be used

to determine the density of trees and shrubs in the reclaimed areas. Locations of monitoring will be random within each of the reclaimed areas and recorded. The final 25% of the tree and shrub live plantings will be included in the 4th year density counts. This process will be repeated in the 8th year.

At the time of bond release, or after the 10 year responsibility period has passed, similarity between the reclaimed area and corresponding reference area will compare life forms and/or species present in each community by the use of similarity indices. Indices of similarity provide the means of mathematically comparing the plant communities in the two areas. One of, or a combination of the three indices found in the Vegetation Guidelines, Appendix B will be used to determine the similarity between the reclaimed and reference area. If another index (or combination thereof) is used, Division approval will be required. Similarity will be considered successful when the index value is at least 70% of the reference area.

All vegetation monitoring data will be reported annually. This report will contain a narrative of the actual monitoring methods used, results, and a discussion of the overall success or failure of each area. Raw data sheets will also be included in the annual reports. Standards attained at the time of bond release will be approved by the Division of Wildlife Resources (DWR) and the Division of Oil, Gas and Mining.

The Revised Universal Soil Loss Equation (RUSLE) is used to model sediment loss from disturbed/reclaimed areas. Program parameters are discussed in R645-301-700: Hydrology. Monitoring of sediment will occur at monitoring points setup above and below the disturbed area of the site. This information will be reported annually.

R645-301-300 BIOLOGY SECTION

APPENDIX A
VEGETATION SURVEY

♦ **NORTH RILDA LEASE AREA VEGETATION SURVEY AND EVALUATION, SEPTEMBER, 1997, BY PATRICIA K. JOHNSTON**

ENERGY WEST MINING COMPANY

North Rilda Lease Area
Vegetation Survey and Evaluation
September, 1997

Submitted to:

Energy West Mining Company
P.O. Box 310
Huntington, Utah

Submitted by:

Patricia K. Johnston
399 "E" Street
Helper, Utah 84526
(801)472-3321

Energy West Mining Company, North Rilda Lease Area
Vegetation Survey and Evaluation
September, 1997

1.0 Introduction

Energy West Mining Company, a wholly-owned subsidiary of PacifiCorp, an Oregon corporation, submitted an application to the U.S. Forest Service to permit the North Rilda Lease Area adjacent to the Deer Creek Mine. Based on the current mine layout, the two southern panels of each seam are projected to extend below the Castlegate Sandstone escarpment. As specified in the lease stipulations, "except at specifically approved locations, the Castlegate escarpment must be protected from mining induced failure." Where escarpment failure is proposed or anticipated, an environmental analysis will be needed to assess the impacts.

The scope of this report is for a vegetation survey to address vegetation resources that would be affected by escarpment failure. This vegetation survey addresses the following areas:

1. Threatened, Endangered and Sensitive Plants
   a. Identify plant species occurrence in the survey area.
   b. Depict plant species occurrence.
   c. Relative abundance.

2. Vegetation
   a. Delineate and describe vegetation communities and relative abundance of each community in the survey area.
   b. Map vegetation communities based on the two dominant species (dominant overstory/dominant understory) in the survey area.

The vegetation survey at the North Rilda Canyon Lease Area was conducted by privately contracted environmental consultant, Patricia K. Johnston, Wildlife/Vegetation Specialist, September, 1997.

2.0 Methodology

Vegetation Community Mapping

Initial research included coordination with Robert Thompson, Range Conservationist of the U.S. Forest Service (USFS), Leland Sasser, Soil Scientist and George Cook, Range Conservationist of the Natural Resource Conservation Service (NRCS).

Aerial photos provided by Energy West of the North Rilda Canyon Lease taken in 9/94, USGS topographic maps, and field review (including extensive hiking) were used to map vegetation communities within the 1,960 acre lease area.

Initially, the scope of work was to map vegetation communities below the escarpment area, those communities that had the potential to be impacted by an escarpment failure. However, it was requested by Thompson, USFS to expand the scope of work to map all vegetation communities within the 1,960 acre lease area.

Threatened, Endangered and Sensitive Plants

Only one species, Hedysarum occidentale var. canone Canyon sweetvetch or Coal sweetvetch, was identified by the USFS, Thompson, that would require attention. As per phone conversation with Larry England, U.S. Fish & Wildlife Service, November 17, 1997, H.occidentale var. canone is listed as a Forest Service sensitive species and has no special listing with the USF&W. It is not protected or given special consideration with any T&E designation.

It was addressed with Thompson, USFS, the lateness of the growing season and that the flowering season for H. occidentale var. canone, would have been past by at least 6-8 weeks. However, due to the distinctive vegetative characteristics of this plant, Thompson was satisfied with the survey time of year. Further, the possible occurrence of H. occidentale var. canone within the potential escarpment failure area was remote.

3.0 Results

Vegetation Mapping

Four major vegetation communities and one major vegetation community complex were described upon field review; Upland Very Steep Shallow Loam (Pinyon-Juniper)-578 acres, Mountain Complex-556 acres, Mountain Stony Loam (Browse)-68 acres, Mountain Very Steep Stony Loam (Douglas Fir)-705 acres, and Loamy Bottom-53 acres. After careful review of the soil and vegetative information provided by both the U.S. Forest Service and the Natural Resource Conservation Service, it was determined that the mapping units as described by the NRCS were more closely associated with the vegetative communities in the North Rilda Canyon Lease Area. The preliminary NRCS Emery County Soil Survey meets and slightly overlaps the east boundary of the lease area. The following vegetation communities were mapped on behalf of Energy West by Johnston, vegetation consultant, September - October, 1997.

Vegetation Community (Ecological Site)

Upland Very Steep Shallow Loam - Pinyon-Utah Juniper:

Overstory: Pinyon - Utah Juniper (scattered Douglas fir)
Understory: Sagebrush and salina wildrye

The upland very steep shallow loam occurs on the south facing slopes of the North Rilda Canyon Lease area. It occurs between 7400-8600'. At the lower reaches it occurs on the toe slopes, 0-15% slope, that rapidly rise into slopes of 50-70%. This area is bound at its upper reaches by the Castlegate escarpment. This vegetation boundary is marked more significantly by an elevation change, at which point the Utah Juniper drops out of the plant community and production of the vegetation community increases, at which point the Mountain Complex becomes the vegetation community.

Mountain Complex:

Mountain Stony Loam (Browse)
Overstory: Pinyon-Utah juniper
Understory: Salina wildrye and mountain sagebrush
Mountain Shallow Loam (Salina Wildrye)

Overstory: Curlleaf mountain mahogany, serviceberry, pinyon and Utah juniper
Understory: Salina wildrye, sagebrush and snowberry

Mountain Loam
Overstory: none
Understory: Salina wildrye, mountain sagebrush and snowberry

Mountain Stony Loam (Browse) 60%, Mountain Shallow Loam (Salina Wildrye) 25%, Mountain Loam (Salina Wildrye) 15%, vegetation community components are so intricately intermingled that it was not practical to map them separately.

The Mountain Shallow and Stony sites are on the south and east facing slopes. Slopes range from 30-50% and between 8600-9400'. the Mountain Loam (Salina Wildrye) site is predominately on the mountain ridgetop, but does occur in patches on the side slopes. Slopes are fairly flat on the ridgetops 3-15%, however, can be as high as 50% on the side slopes.

The north facing slopes both north and south of the Rilda Canyon road are dominated by the Mountain Very Steep Stony Loam-Douglas fir vegetation community.

The slopes range from 40-60% and occur between 8000-9600 feet.
Overstory: Douglas fir
Understory: Elk sedge, salina wildrye, snowberry, Oregon grape

The last vegetation community that is present within the North Rilda Canyon lease area is the Loamy Bottom site. It is the area affected by the presence of the perennial stream and high water table in the canyon bottom.

Overstory: Aspen, blue spruce, douglas fir

Understory: (highly diverse with grasses, forbs and shrubs) snowberry, mountain sagebrush, needlegrass (Stipa spp.) and wildrye (Elymus spp.)

Threatened, Endangered and Sensitive Plants

H. occidentale var. canone, is typically distributed Pinyon-juniper, sagebrush, and wash communities between 5,000 and 8,000 feet elevation. The Castlegate Escarpment occurs at approximately 8800 feet within the Mountain Stony Loam, Mountain Shallow Loam, Mountain Loam and Mountain Very Steep Stony Loam - Douglas Fir vegetation communities.

H.occidentale var.canone was not found after a field survey was conducted to determine the its presence in Rilda Canyon and within the lease area.

R645-301-300 BIOLOGY SECTION

APPENDIX B
VEGETATION SURVEY

♦ **NORTH RILDA CANYON PORTAL FACILITIES AREA VEGETATION SURVEY, 2003, MT. NEBO SCIENTIFIC, INC.**

R645-301-300 BIOLOGY SECTION

APPENDIX B

PacifiCorp contracted Mt. Nebo Scientific. Inc to conduct a vegetation survey of the proposed North Rilda Canyon Portal Facilities. The field survey was conducted during September 2003 and included identifying and mapping vegetation types and accessing potential reference areas. PacifiCorp will prepare detail vegetation maps including reference areas based upon the recommendation of the vegetation consultant. Findings of the soil survey will be included as Appendix B when available.

R645-301-300 BIOLOGY SECTION

APPENDIX C
RAPTOR SUVEY

♦ 2003 RAPTOR SURVEY
♦MAP 2-18B

R645-301-300 BIOLOGY

APPENDIX C

2003 RAPTOR SURVEY

Field Notes

Nest Number	Species	Status	Comments
956	GE	Inactive (I)	Old Dilapidated (OD)
957	GE	I	
64	Falc	I	Based on Greenery
67	GE	Tended (T)	
66	GE	I	
65	GE	I	
68	GE	OD	Little Material left in Nest
950	GE	I	
69	GE	Active (A)	10 days old
70	GE	I	
New	GE	I	Next to Prism
1200	GE	I	Possible # 71
72	GE	OD	Little Material
73	GE	I	2 Nests Side by Side
74	GE	I	
New	Falc	I	Lots of Use in the Past
New	Falc	I	Lots of Use in the Past
New	GE	I	
New	GE	I	
753	GE	I	
951	GE	I	
63	GE	T	Based on Greenery
952	GE	I	
953	RTHA	I	
751	Raven	I	
1203	GE	I	
937	GE	I	
1202	RTHA	I	
955	GE	I	
954	GE	I	
75	GE	I	Poor Condition, OD
New	RTHA	I	Possible Raven Nest

Nest Number	Species	Status	Comments
961	GE	I	
New	GE	OD	Dead Eagle Chick in Nest
1287	GE	I	
New	RTHA	I	
New	RTHA	I	
New	RTHA	I	
1205	GE	T	Based on Greenery
1206	RTHA	I	
78	GE	I	
963	GE	T	Greenery
79	GE	T	Greenery
New	GE		
80	GE	T	Greenery
81	GE	T	Greenery
1208	RTHA	I	
1210	GE	I	
1211	GE	T	Lots of Greenery
1282	RTHA	I	
1284	RTHA	I	
1283?	RTHA	I	
1285	RTHA	I	

Total Nests Observed: **53**
Total Nests Active: **1**

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

R645-301-300 BIOLOGY SECTION

MAPS

♦ **MAP 3-1: VEGETATION MAP**

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

R645-301-400 LAND USE & AIR QUALITY SECTION

TABLE OF CONTENTS

R645-301-400 LAND USE AND AIR QUALITY 1
- R645-301-410 LAND USE 1
- R645-301-411 ENVIRONMENTAL DESCRIPTION 1
- R645-301-412 RECLAMATION PLAN 2
- R645-301-413 PERFORMANCE STANDARDS 3
- R645-301-420 AIR QUALITY 3
- R645-301-421 CLEAN AIR ACT 4
- R645-301-422 UTAH DIVISION OF AIR QUALITY 5

REFERENCES:

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

MAPS

4-1 Historical Mine Workings in Rilda Canyon

APPENDICES:

A. "An Intensive Cultural Resource Survey and Inventory for the Rilda Canyon Mine Site", September 30, 2003, SENCO-PHENIX, by John A. Senulis

R645-301-400 LAND USE AND AIR QUALITY

R645-301-410 LAND USE ~~(R645-301-410)~~

R645-301-411 ENVIRONMENTAL DESCRIPTION ~~(R645-301-411)~~

The North Rilda Area is geographically part of East Mountain, a plateau within the Wasatch Plateau. The area lies primarily between two major tributaries of Huntington Canyon -- Mill Fork Canyon and Rilda Canyon. ~~Two~~ Three vegetation types dominate the North Rilda Area. They are the mixed coniferous forests that occupy the north and northeast facing slopes (upper elevations), and the pinyon-juniper and mountain brush communities ~~that are~~ found on the drier south and southwest facing slopes. Elevations of the area range from 7,500 to 9,400 ft above sea level. For a map showing the North Rilda Area and its geographical surroundings as well as plant communities, see ~~refer to Vol. 4,~~ R645-301-300, Map ~~2-14~~3-1.

Premining land use of the area was primarily livestock grazing, wildlife habitat and occasional timber cutting.

The USDA Forest Service has identified the following uses for the general area, including the North Rilda Area: big game winter range (Elk-critical, deer-high value), mining and mineral development, and general rangeland including timber and forage. Additional information about land use of the permit area as a whole can be found in Vol. 1, Part 2 of the MRP.

At present, the area is used as wildlife habitat with some grazing permits issued by the USDA Forest Service. Deer and elk use the upper elevations of East Mountain for summer range, and the lower slopes and drainages for winter range.

Productivity of the pinyon-juniper communities of the area have been previously estimated at 100-325 lbs. per acre. Mixed conifer communities of the area have been estimated at 167-290 lbs. per acre (Refer to Volume 1, Part 2).

The Land Use Plan for the Wasatch Plateau designates no recreational development or timber sales on East Mountain but does specify improvements to big game range and the protection of watersheds. Private timber sales have taken place south of the North Rilda area.

R645-301-411.110 MAPS

Maps showing the present permit area and the proposed North Rilda Area with respect to environmental description and land use are included in the MRP. Vol. 4, Map 1-2 shows the

surface ownership information. ~~Vol. 4,~~ Map ~~2-14~~3-1 shows the vegetation communities of the area. Vol. 4, Map 2-16 is a general soils map that also shows the North Rilda Area. Vol. 4, Map 2-18A is a land use drawing. Vol. 4, Map 2-19 shows mule deer and elk habitat of the area.

R645-301-411.140 CULTURAL AND HISTORIC RESOURCES INFORMATION

Archeological surveys have been conducted in the permit area adjacent to the North Rilda Area. ~~Refer to Vol. 1, Part 2 for further information.~~ The most recent survey was done in September of 2003, by John A. Senulis (SENCO-PHENIX). This survey report is included as R645-301-400 Appendix A. Mr. Senulis summarizes his survey with this statement, "Neither the site nor any of the isolates are recommended for nomination to the National Register of Historic Places. 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".

R645-301-411.200 PREVIOUS MINING ACTIVITY

The general area has a long history of coal mining. Small mining operations were located in several canyons within the Deer Creek permit area including: Deer Creek, Meetinghouse, Rilda, and Mill Fork canyons. A majority of the operations commenced in the early 1940's and terminated in the mid 1950's. ~~Two~~ Four abandoned mines are located in Section 28, Township 16 South, Range 7 East of the North Rilda Area, the Leroy (aka Comfort Mine), Jeppson, ~~and the~~ Rominger ~~Mines~~ (aka Ferrell Mine), and Helco mines (refer to Map ~~HM-9 included with submittal~~4-1 for extent of historical workings). ~~Both~~ All of the mines are located in the Hiawatha seam and were reclaimed by AML in 1988. The Johnson Mine (Section 29, Township 16S, Range 7E) is located up canyon from the proposed new mine site and had no associated workings as documented in H.H. Doeling, 1972.

Current mining operations are being conducted at the ~~Trail Mountain and~~ Deer Creek Mine~~s~~. Trail and Cottonwood/Wilberg mine are in temporary cessation as of mid-2001. The Des Bee Dove mining complex was completely reclaimed in 2003. Mining operation plans and geologic information for these mines have been described in Vol. 2, Part 3 and Vol. 8.

R645-301-412 RECLAMATION PLAN ~~(R645-301-412)~~

In areas where surface disturbances result from coal mining and reclamation operations, regrading and revegetation will be conducted to restore the areas to their premining conditions which they were capable of supporting prior to mining. Because ~~no~~ such a small surface disturbance is planned for the North Rilda Area, little or no effect to the past~~, present and~~ or

future land use is anticipated. The land will be reclaimed to the original land use practices of ~~The current management and practices including~~ grazing and wildlife habitats ~~will not be changed. Because of this, detailed reclamation or postmining land-use plans are not submitted in this document.~~

A detailed reclamation plan will be developed for the North Rilda Canyon Portal Facilities area and included in Section R645-301-200 thru R645-301-700 of this volume.

R645-301-412.300 SUITABILITY AND COMPATIBILITY

The reclamation soil sampling will identify any soil that is not suitable. This soil, if found, will be placed at least 4 feet below the final grade surface. This will ensure suitable growth material for vegetation. All fills will be graded at slopes compatible with the surrounding areas.

R645-301-413 PERFORMANCE STANDARDS ~~(R645-301-413)~~

All disturbed areas will be restored in a timely manner to conditions they were capable of supporting before mining. Liability will be for the duration of the coal mining and reclamation operations and for the period of extended responsibility for achieving successful revegetation. All post mining land use criteria will be satisfied before the bond is fully released.

R645-301-413.100 POSTMINING LAND USE

~~There will be no disturbance to the existing surface on the North Rilda Area, therefore performance standards of the postmined land are not applicable.~~
Reclamation of the small area of disturbance in the North Rilda Canyon portal facility to the postmining land use will take place soon after closure of the facilities. Because of the small area needing to be reclaimed, the process can take place in one construction season. Vegetation performance standards will be met by comparison to undisturbed vegetation reference areas.

R645-301-420 AIR QUALITY ~~(R645-301-420)~~

~~The Air Pollution Control Plan will not change with the addition of the North Rilda Area to the permit area. The plan is described in Vol. 2, Part 3 of the MRP.~~

Air pollution control measures are described in the "Approval Order" issued by the Division of Air Quality. This order has conditions that the operator has to comply with to reduce emissions that may effect the air quality. Because processing is not being done at the North Rilda Canyon portal facilities, the controlled emission will be fugitive dust emissions. Those are controlled by

typical dust suppressant measures. The Division of Air Quality requires that the Approval Order be in place and complied with by the operator for the live of the facilities operation. Periodic inspections, by the Division of Air Quality, are done on the site to verify compliance. ~~have been applied and will be applied throughout the life and subsequent reclamation of the Deer Creek Mine site.~~

Some of the dust suppressant measures typically taken are: ~~The main service road and parking lots are~~ asphalt surfaceds. ~~Service roads to the mine fan and coal handling facilities are gravel surfaced.~~ restricted speeds for vehicular traffic, ~~on these roads is controlled to minimize contribution of fugitive dust. Vehicle speeds on the main service road are restricted to 35 mph and speed limit signs have been posted.~~ limitations for travel on ~~the mine fan~~ service roads. ~~is limited to once a day at low speeds. The service road for the coal handling facilities is used daily at low speeds for access by service and labor personnel. Fugitive dust control procedures are implemented throughout the coal handling process. All commonly utilized belt conveyors are covered and equipped with belt scrapers to prevent coal dust generation. Transfer points are enclosed and chute inlets and outlets are rubber curtained to minimize open areas.~~

~~The steep natural terrain restricts unauthorized travel on other than established roads.~~

All areas adjacent to roads or travelways have been planted for revegetation. Reseeding is repeated until vegetation is adequately established. Revegetation is applied on all disturbed surfaces and regraded areas as soon as season and weather permit.

~~The high moisture content of the coal at Deer Creek Mine provides fugitive dust control throughout the coal handling process. Analysis of more than 5,000 samples taken during processing show an average 8.62% inherent and surface moisture content. Coal dust generation is reduced throughout the handling process by the dampening effect of this moisture.~~

~~The captive nature and quick use of the Deer Creek Mine product eliminates the possibility of spontaneous combustion conditions developing. Long term stockpiling within the permit area is unlikely.~~

R645-301-421 CLEAN AIR ACT ~~(R645-301-421)~~

Coal mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act (42 U.S.C. Sec. 7401 et seq.) and any other applicable Utah or federal statutes and regulations containing air quality standards.

R645-301-422 UTAH DIVISION OF AIR QUALITY ~~(R645-301-422)~~

The operator has coordinated compliance efforts with the State of Utah, Division of Air Quality. The current Approval Order (AO) issued to the operator is DAQE-926-96 and is dated October 4, 1996. Refer to R645-301-420.

R645-301-400 LAND USE & AIR QUALITY SECTION

APPENDIX A
ARCHEOLOGY SURVEY

♦AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY FOR THE RILDA CANYON MINE SITE, SEPTEMBER 30, 2003, SENCO-PHENIX

SENCO-PHENIX

AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE RILDA CANYON MINE SITE

Price Ranger District
Manti - La Sal National Forest

Emery County, Utah

PERFORMED FOR
Energy West Mining Company

In Accordance with Forest Service and
Utah State Guidelines
Antiquities Permit #U03SC0793f

SPUT-461
September 30, 2003

John A. Senulis

Direct Charge of Fieldwork

UTAH SHPO

COVER SHEET

AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE RILDA CANYON MINE SITE

Energy West Mining Company

State #U03SC0793f

Report Date: September 30, 2003

Principal Investigator: John A. Senulis

Field Supervisor: John A. Senulis

Acreage Surveyed: 7 acres

Intensive Acres: 7 Recon/Intuitive Acres: 0

U.S.G.S. 7.5 Quad: Rilda Canyon, Utah (1976) & Hiawatha, Utah (1978)

Sites Reported	Number	Smithsonian Site #(s):
Archeological Sites:	1	42EM3115
Revisit (No IMACS update)	0	
Revisit (IMACS update attch.)	0	
New Sites (IMACS attached)	1	42EM3115
Archeological Site Total:	1	
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

CULTURAL RESOURCE SUMMARY FORM USFS# ML-00
MANTI-LA SAL NATIONAL FOREST USHPO# U00SC0563f
(Attach Narrative Report Form)

FS PROJECT NO.: ML- - - Name: AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE RILDA CANYON MINE SITE

Manti-La Sal	Price	T.16S, R. 7E Sec. 22, 27, 28
Forest Name	**District**	**T/R/Sec(s)**

Sept. 30, 2003 SENCO-PHENIX/John Senulis
Report Date **Organization/PI**
Benefitting Function:
__Heritage Project x 106 Compliance Project __Assessment or Resource Assistance (Not a 106 undertaking)

Project Cost: Vehicle/Gas NA USFS Amt. $ 0
Supplies Proponent Amt. $
Salary 0 Contributed Amt. $

(2xvol) Per Diem/Vol_____TOTAL $ 0
Other_____
Overhead

Nature of Work (Check all that apply):
x Survey
__ Monitoring /Docum.
__ Evaluation or Test Excavation
__ Interpretation
__ Site Protection/ Stabilization
__ Other (Explained below)
__ MOU/Clearance (No new surv)
__ Assessment/Plan
__ Mitigation: Excavation or Documentation
__ Discovery
__ DamageAssessment/ Vandalism

Total Project Acres: 200
Acres Surveyed: 10
New Sites Recorded: 1
Sites Monitored W/ Documentation: 0

Project Photographs Catalog #s: SPUT461-1-11
Artifacts (isolates) Collection #s: None
Location of Curation:

Tracking Dates (N/A if not required):
To SHPO_____
Concurrence Rec'd_____
Mylar Updated_____
GIS Digitized_____
Proj. Database Entry_____
Accomplishment Report : FY00

_ Not a 106 Undertaking/No ground disturbance
_No Effect; No Sites
No Effect Through Design or Mitigation Rec's
X_ Other Effect (See Detail Report)

1 sites located

Determination of Effects on Sites

Certification:
John A Senulis
Reporter's Signature Date 09/30/03 Reviewer Signature Date

COMMENTS:
Recorded one dugout site and four isolated findings, three of which were Ponderosa Pine Scars noted in the narrative portion of the report. Ineligible properties no further work recommended.

FSM 2360 MLNF/4-98

Abstract

SENCO-PHENIX performed a combination sample and intensive cultural resource survey on the proposed Rilda Canyon Mine location for Energy West Mining Company. The project area has been previously surveyed several times and reclamation of three abandoned mines has taken place. Intensive survey was undertaken in areas not covered by the previous surveys, principally along Utah State highway 31. The sample survey was undertaken at the request of Forest Archeologist, Chris Horting, who had observed Ponderosa Pines with stripped bark and wanted them recorded as isolated finds. Rilda Canyon is a drainage of Huntington Creek. The project area is in the Price Ranger District of the Manti-La Sal National Forest. The purpose of the survey was to identify and evaluate cultural resources that may exist within the project area.

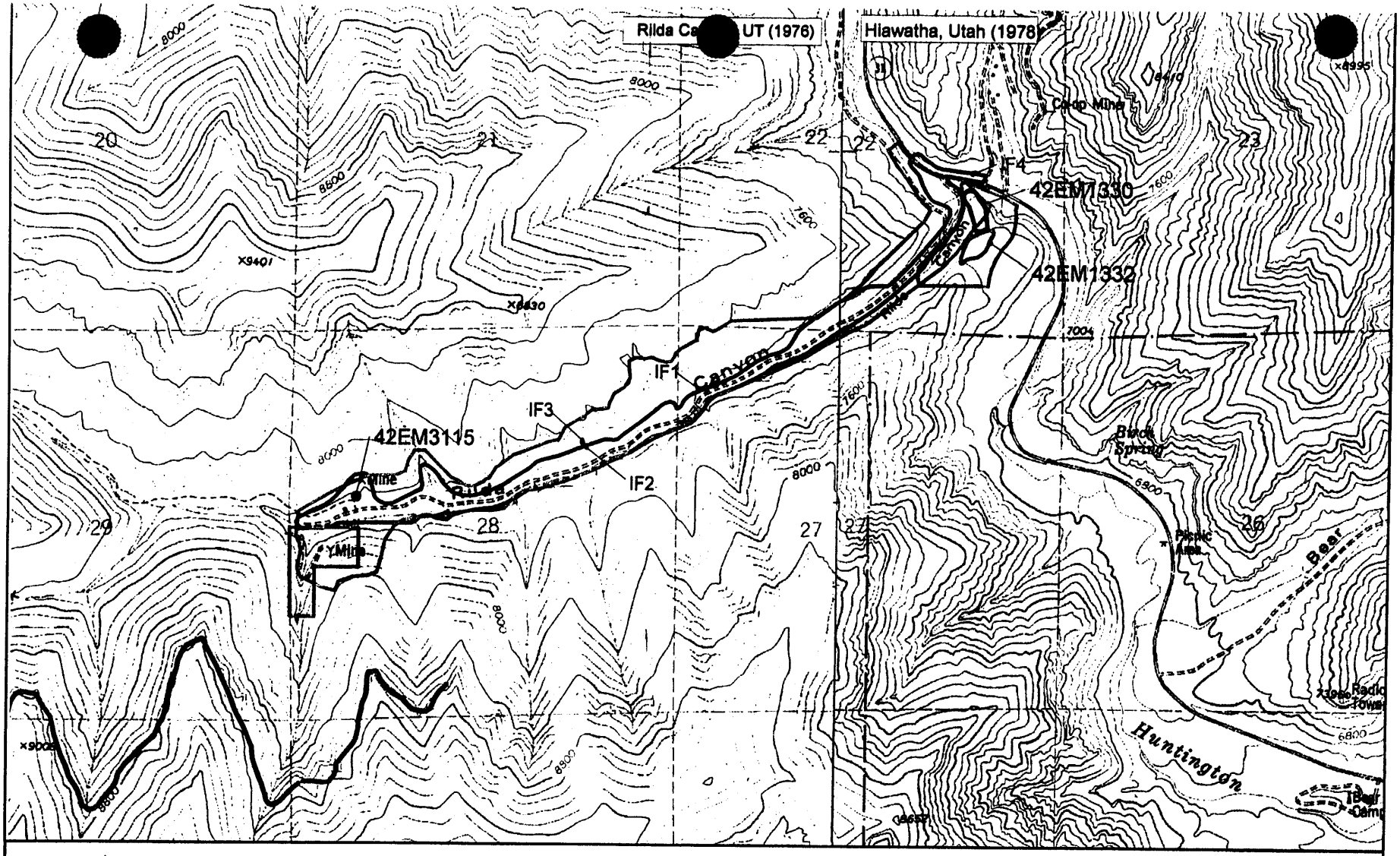
Cultural resources were located in the form of one archeological site and four isolated findings as follows:

- 42EM3115 The site is a historic buttressed dugout constructed with a wooden front and rock lined interior. The front is rough sawn milled lumber with boards ranging in size from 7 to 9 inches wide and ¾ inch thick. The low door measures 39 ½ inches tall by 19 ¼ inches wide. The interior is 10 by 8 feet tapering slightly to the back. There is a partial four course dry laid rock lining capped by a 6"log, which probably acted as a roof support. There are some pieces of tin roofing nearby that probably were used for the ostensibly flat roof. Except for the pieces of tin roofing there were no artifacts associated with the dugout and there are no related features as the area has been cleaned up by mine reclamation. The stone buttress in front could indicate that the structure was a powderhouse at one time. There is an old two-track road that leads close to the site that may be an old mining road. The dugout is in the vicinity of the former Comfort, Helco and Rominger mines. The mines were never given archeological site designation and were reclaimed in the late 1980s.

    - IF #1is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 80 cms; at it narrowest 20 cms; and it is 260 cms. high. The scar begins 20 cms. off the ground and faces ENE. There are axe marks on the tree; the first is 40 x 26 cms; second 42 x 25 cms; third 29 x 11 cms. The Ponderosa Pine is ca. 21 meters high with a circumference of 116 cms. and diameter of 37 cms. Location is 488647 mE and 4361810 mN. See photo 1 attached.
    - IF #2 is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 40 cms; at it narrowest 10 cms; and it is 160 cms. high. The scar begins 20 cms. off the ground and faces SW. There are axe marks on the top and bottom of the scar. The Ponderosa Pine is ca. 25 meters high with a circumference of 116 cms. and diameter of 37 cms. Location is 488181 mE and 488181 mN. See photo 2 attached.
    - IF #3 is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 25 cms; at it narrowest 6 cms; and it is 76 cms. high. The scar begins 20 cms. off the ground and faces SE. There are faint axe marks on the bottom of the scar. The Ponderosa Pine is ca. 24 meters high with a circumference of 203 cms. and diameter of 65 cms. Location is 488181 mE and 488181 mN. See photo 3 attached.
    - IF # 4 is a historical memorial in the form of a large boulder on a concrete pad with a brass plate reading "Erected August 21, 1937 by the descendents of John F. Wakefield who passed here in 1878or9 (obscured by

bullet scar). This his 90th birthday." The memorial is on the side of the Huntington Highway.

Neither the site nor any of the isolates are recommended for nomination to the National Register of Historic Places. 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 1:24000
1"=2,000'

Previous Survey
Current Survey
Eligible Sites
Ineligible Sites

Rilda Canyon Mine
Energy West Mining Company
Emery County, Utah
Sections 22, 27, 28, T16S, R7E
September 2003
SPUT- 461

Project Location

The survey area is within the Rilda Canyon branch of the Huntington Creek drainage of the Price and Ferron Ranger Districts of the Manti-LaSal National Forest in Emery County, Utah. The new mine will be in Sections 22, 27 and 28, T16S, R7E, Emery County, Utah. The project area is shown on the enclosed copy of U.S.G.S. 7.5' Composite Quad: Rilda Canyon, Utah (1976) and Hiawatha, Utah (1978).

Environment

The project area is within the Wasatch Plateau, which is part of the Colorado Plateau Province. The Wasatch Plateau is a north to south trending highland that overlooks the Castle Valley to the east and the Sanpete Valley to the west. Rilda Canyon Creek is a perennial tributary of Huntington Creek. The generally west to east flowing stream is within Rilda canyon at an altitude of 7,100 to 7,800 feet.

The diversified vegetation included grassy sagebrush meadows interspersed with aspen groves and conifer forests including White and Ponderosa Pine. Some of the understory species noted included wheat grass, bluegrass, common juniper, shrubby cinquefoil, strawberry, penstemon, mules-ear, needle grass, lupine, manzanita, sagebrush, sedge, currant, and gooseberry.

Previous Research

John Senulis of SENCO-PHENIX performed a file search in the Forest Service Office on September 2 and 8, 2003. The file search revealed that many cultural resource surveys had been done in the general project area. The following are the previous studies within or near to the project area which meet professional standards:

Sections 22, 27, 28 T16S, R7E:

- 1979, Science Applications surveyed the Rilda Canyon Mine complex in essentially the same parts of Rilda Canyon as the current project. Five archeological sites were recorded. That number was reduced to two by the Esca-Tech work. (ML 79-305)
- 1982, Esca-Tech surveyed a larger area of Rilda Canyon for another proposed mine. They felt that two of the Science Application rockshelters were not actually habitation sites and that they should not have site designations. The Forest Service and Utah SHPO later confirmed this. Two sites were combined into one and the following were the sites in Rilda Canyon: (ML 82-312)
    - 42EM1330 is a lithic scatter overlain by a historic dugout site. The site was near the highway and heavily impacted by modern use. The site was not recommended for nomination to the National Register of Historic Place (NRHP).
    - 42EM1332 is an extensive lithic scatter (campsite) with several hearths and a Pinto like projectile point. The site was recommended for nomination to the NRHP.

  Neither site will be impacted by the proposed project.

- 1986, Abajo archeology surveyed the non-forest portion of Huntington Canyon south of Rilda Canyon. No cultural resources were located in the vicinity of the current project. (ML 86-9)

- 1988, Les Wikle of the Forest Service with concordance from Diana Christensen of the Utah SHPO's office made a determination of no effect and Utah DOGM reclaimed the existing mines in Rilda Canyon. (ML 88-472)
- 1990, AERC did a sample survey in upper Rilda Canyon. No cultural resources were located in the current project area. (ML 90-374)
- 1993, Neilson Consulting surveyed a powerline through Rilda Canyon. No cultural resources were located. Nielson concurred with Esca-Tech that the rockshelters were not sites. (ML 94-723)
- 1994, The Forest Service surveyed Rilda Canyon road for an Emery County upgrade. No new archeological sites were discovered and it was determined that the rockshelters were not sites and that the reclaimed Helco, Comfort and Rominger mines had no remaining integrity. (ML 94-724)
- 1994, AERC surveyed potential subsidence zones in Rilda Canyon and elsewhere. No cultural resources were found in Rilda Canyon. (ML 94-734)
- 1997, The Forest Service surveyed restoration areas in Huntington Canyon. No cultural resources were located near the current project area. (ML 97-844)
- 1997, AERC surveyed escarpments in Rilda Canyon and elsewhere. No cultural resources were located in Rilda Canyon. (ML 97-854)

Methodology

John and Jeanne Senulis and Robert & Margene Hackney of SENCO-PHENIX performed a Class III intensive walkover survey on September 9 for the proposed new highway turnout. Meandering transects no further spaced than 15 meters were employed. The side of the highway has been disturbed by highway construction for at least 50 feet from the edge of the road. In addition a drive through sample survey was done to locate and record any stripped bark scars on Ponderosa or other pines, particularly in areas that might be impacted. Site 42EM3115 was discovered.

All field notes and 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 archeological site and four isolated findings as follows:

- 42EM3115 The site is a historic buttressed dugout constructed with a wooden front and rock lined interior. The front is rough sawn milled lumber with boards ranging in size from 7 to 9 inches wide and ¾ inch thick. The low door measures 39 ½ inches tall by 19 ¼ inches wide. The interior is 10 by 8 feet tapering slightly to the back. There is a partial four course dry laid rock lining capped by a 6"log, which probably acted as a roof support. There are some pieces of tin roofing nearby that probably were used for the ostensibly flat roof. Except for the pieces of tin roofing there were no artifacts associated with the dugout and there are no related features as the area has been cleaned up by mine reclamation. The stone buttress in front could indicate that the structure was a powderhouse at one time. There is an old two-track road that leads close to the site that may be an old mining road. The dugout is in the vicinity of the former Comfort, Helco and Rominger mines. The mines were never given archeological site designation and were reclaimed in the late 1980s.

- IF #1is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 80 cms; at it narrowest 20 cms; and it is 260 cms. high. The scar begins 20 cms. off the ground and faces ENE. There are axe marks on the tree; the first is 40 x 26 cms; second 42 x 25 cms; third 29 x 11 cms. The Ponderosa Pine is ca. 21 meters high with a circumference of 116 cms. and diameter of 37 cms. Location is 488647 mE and 4361810 mN. See photo 1 attached.
- IF #2 is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 40 cms; at it narrowest 10 cms; and it is 160 cms. high. The scar begins 20 cms. off the ground and faces SW. There are axe marks on the top and bottom of the scar. The Ponderosa Pine is ca. 25 meters high with a circumference of 116 cms. and diameter of 37 cms. Location is 488181 mE and 488181 mN. See photo 2 attached.
- IF #3 is a stripped bark scar on a Ponderosa Pine tree. The scar at its widest width is 25 cms; at it narrowest 6 cms; and it is 76 cms. high. The scar begins 20 cms. off the ground and faces SE. There are faint axe marks on the bottom of the scar. The Ponderosa Pine is ca. 24 meters high with a circumference of 203 cms. and diameter of 65 cms. Location is 488181 mE and 488181 mN. See photo 3 attached.
- IF # 4 is a historical memorial in the form of a large boulder on a concrete pad with a brass plate reading "Erected August 21, 1937 by the descendents of John F. Wakefield who passed here in 1878or9 (obscured by bullet scar). This his 90th birthday." The memorial is on the side of the Huntington Highway.

Neither the site nor any of the isolates are recommended for nomination to the National Register of Historic Places. 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 Manti La Sal Forest Ranger and the Utah SHPO.

Isolate Photographs

IF #1 View West

IF # 2 View Northwest

IF #3 View North

IF #4 View East

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. 42EM3115**
***2. Agency No.**
***3. Temp. No.**

4. State: Utah **County** Emery
5. Project: Rilda Canyon Mine
***6. Report No:** U03SC0793f
7. Site Name / Property Name:
8. Class ☐ Prehistoric ☒ Historic ☐ Paleontologic ☐ Ethnographic
9. Site Type: Historic Dugout-possible powderhouse
***10. Elevation:** 7600 ft.
***11. UTM Grid Zone:** 12 487213 **m E** 4361367 **m N**
***12. C ¼ of SE ¼ of SW¼ of NW ¼ Section: 28, T16S, R7E**
***13. Meridian:** SLC
***14. Map Reference:** Rilda Canyon, Utah (1976)
15. Aerial Photo:
16. Location and Access: From Huntington Utah proceed westerly on Huntington Canyon road (Utah State #31) 7.3 miles to the Rilda Canyon Turnoff to the southwest. Take the improved county road 1.85 miles. Walk westerly 200 feet uphill to site on the west edge of intermittent drainage.
***17. Land Owner:** Manti-La Sal Forest
***18. Federal Administrative Units:** Manti-La Sal Forest
***19. Location of Curated Materials:** NA

20. Site Description: The site is a historic buttressed dugout constructed with a wooden front and rock lined interior. The front is rough sawn milled lumber with boards ranging in size from 7 to 9 inches wide and ¾ inch thick. The low door measures 39 ½ inches tall by 19 ¼ inches wide. The interior is 10 by 8 feet tapering slightly to the back. There is a partial four course dry laid rock lining capped by a 6"log, which probably acted as a roof support. There are some pieces of tin roofing nearby that probably were used for the ostensibly flat roof. Except for the pieces of tin roofing there were no artifacts associated with the dugout and there are no related features as the area has been cleaned up by mine reclamation. The stone buttress in front could indicate that the structure was a powderhouse at one time. There is an old two-track road that leads close to the site that may be an old mining road. The dugout is in the vicinity of the former Comfort, Helco and Rominger mines. The mines were never given archeological site designation and were reclaimed in the late 1980s.

***21. Site Condition** ☐ Excellent (A) ☐ Good (B) ☒ Fair (C) ☐ Poor (D)
***22. Impact Agent(s):** Erosion, reclamation
***23. National Register Status** ☐ Significant (C) ☒ Non-Significant (D) ☐ Unevaluated (Z)
Justify: The site has no artifacts to date it and the context has been destroyed by reclamation.
24. Photos: 03EM3115-5
25. Recorded by: John Senulis
***26. Survey Organization:** SENCO-PHENIX **28. Survey Date:** 9/9/2003
27. Assisting Crew Members: Jeanne Senulis, Robert & Margene Hackney

List of Attachments: ☐ Part B ☒ Topo Map ☒ Photos ☐ Continuation Sheets
☒ Part C ☒ Site Sketch ☐ Artifact/Feature Sketch
☐ Part E ☐ Other

BLM 8100-1
FS R-4 2300-2
3/90

*Encoded data items

Part A - Environmental Data

*29. **Slope:** 03 (Degrees) **Aspect:** 190 (degrees) **Site No: 42EM3115**

*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: Rilda Canyon Creek.

*31. **Geographic Unit:** Wasatch Plateau (TDA)

*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 slope above Rilda Canyon 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, gravelly sandy clay loams

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: H** **Surrounding Site: Q**

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 is mixed conifer forest grading into pinyon-juniper

*35. **Miscellaneous Text:**

36. **Comments/Continuations:**

Part C - Historic Sites

Site No: 42EM3115
Temp No:

1. Site Type: Historic dugout, possible powderhouse

2. Historic Theme(s): Mining

	CULTURAL AFFILIATION	DATING METHOD	CULTURAL AFFILIATION	DATING METHOD
3. Culture:	Euro-American	Cross Dating		

Describe: style of structure

4. Oldest Date: 1910s **Recent Date:** 1960s

How Determined: Guess based upon when mines operated

5. Site Dimensions: 12 m X 8 m **Area:** 75 sq m

6. Surface Collections Method
- [x] None (A)
- [ ] Grab Sample (B)
- [ ] Designed Sample (C)
- [ ] Complete Collection (D)

Sampling Method:

7. Estimated Depth of Cultural Fill
- [x] 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: Shallow, gravelly clay loams
(If tested, show location of site map)

8. Excavation Status
- [ ] Excavated (A)
- [ ] Tested (B)
- [x] Unexcavated (C)

Testing Method:

9. Summary of Artifacts and Debris
- [ ] Glass (GL)
- [x] Metal (ME
- [ ] Nails (NC,NW)
- [ ] Bone (BO)
- [ ] Ceramics(CS)
- [ ] Fabric (FA)
- [ ] Leather (LE)
- [ ] Wire (WI)
- [ ] Tin Cans
- [ ] Ammunition (AM)
- [ ] Wood (WD)
- [ ] Rubber (RB)
- [ ] Domestic Items (DI)
- [ ] Kitchen Utensils (KU)
- [ ] Car/Car Parts (CR)

Describe: The only artifacts were three fragments of tin roofing probably for the dugout's roof.

10. Ceramic Artifacts:

Paste	Glaze/Slip	Decoration	Pattern	Vessel Form(s)	#

a. Estimated Number of Ceramic Trademarks:
Describe:

Part C - Historic Sites

Site No. 42EM3115
Temp No.

Glass:	#	Manufacture	Color	Function	Trademarks	Decoration

Describe:

12. Maximum Density - #/sq m (glass and ceramics):

13. Tin Cans

Type	Opening	Size	Modified	Label/Mark	Function

Describe:

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:

15. Buildings and Structures (locate on site map)

#	Material	Type	#	Material	Type
1	Combination (W)	Dugout (AK)			

Describe: This site is a historic buttressed dugout constructed with a wooden front and rock lined interior. The front is rough sawn milled lumber with boards ranging in size from 7 to 9 inches wide and ¾ inch thick. The low door measures 39 ½ inches tall by 19 ¼ inches wide. The interior is 10 by 8 feet tapering slightly to the back. There is a partial four course dry laid rock lining capped by a 6"log, which probably acted as a roof support. There are some pieces of tin roofing nearby that probably were used for the ostensibly flat roof.

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)*

The dugout is in the vicinity of the former Comfort, Helco and Rominger mines. The mines were never given archeological site designation and were reclaimed in the late 1980s.

1990

IMACS ENCODING FORM

Encoder's Name: J Senulis

To be completed for each site form.
For instructions and codes, see IMACS Users Guide.

A

1 State Site Number: 42Em3115

2 Agency Site Number: -

6 Agency Report Number:

10 Elevation: 7600

11 Zone: 12 | Easting: 487213 | Northing: 4361367

12 1/4: SE | 1/4: SW | 1/4: NW | Sec.: 28 | T.: 16 S | R.: 7 E

13 Merid.: 1

14 USGS Map: Rilda Canyon, Utah (1976)

17 Owner: PR

18 Forest: 10 | Dist./Park: 42

19 Loc. Cur. Materials: NA

21 Cond.: C

22 Impacts: ER DM

23 N.R.:: D

26 Organ.: SC

28 Survey Date: 9-9-03

29 Slope: 03 | Aspect: 190

30 Water: dstance/type: 4 B

31 Geog. Unit: CAC

32 Topographic Locatio 1st: E | 2st: Q

33 Dep.: H

34 Vegetation 1: E | 2: G | 3: H Q

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 Historic Themes: MN

3 Culture/Dating Method: EA F

4 Dates: 1910 1960

5 Area: 75

6 Collect: A

7 Depth: A

8 Excav. Status: C

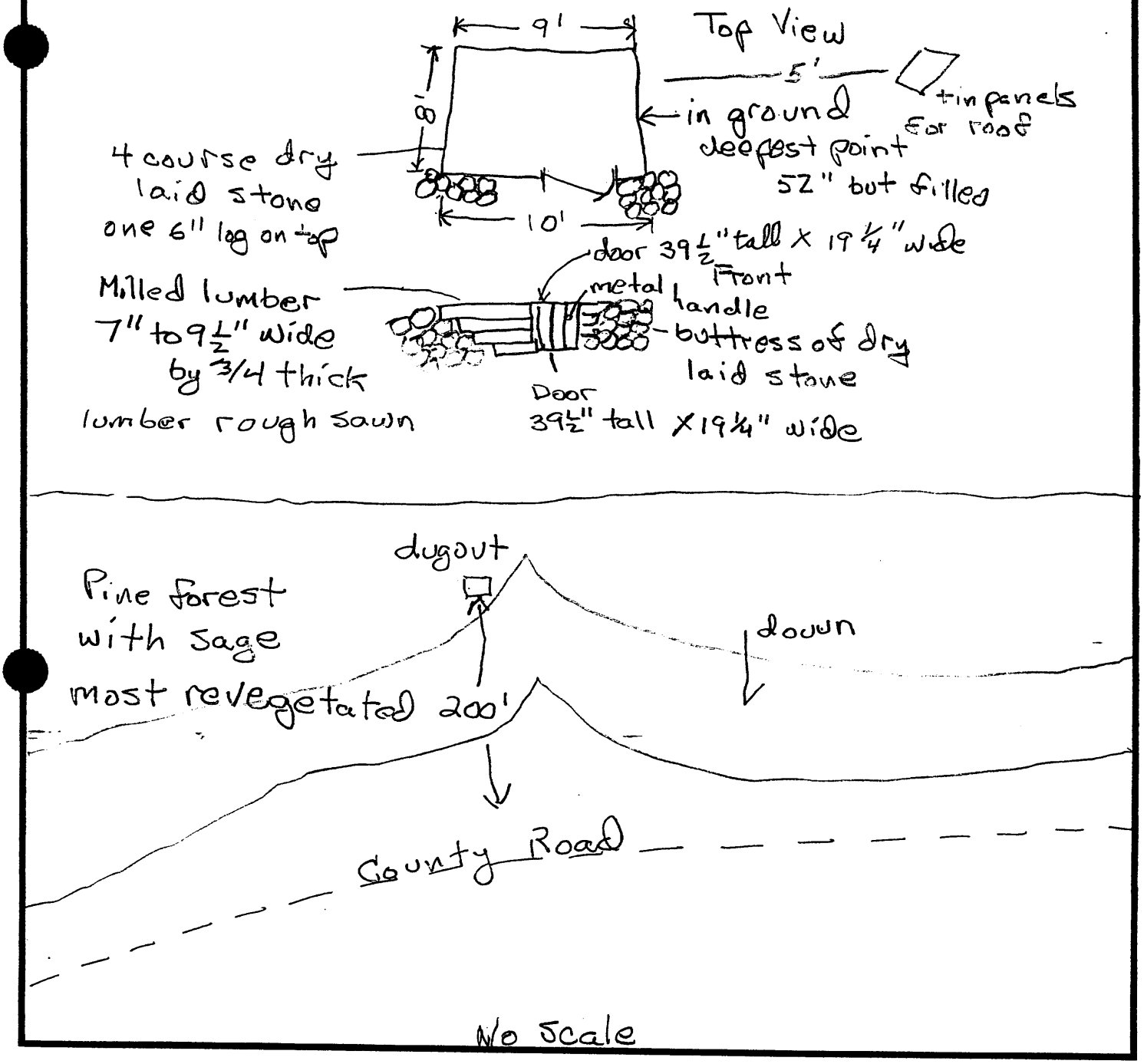
9 Artifacts: ME

14 Features: # / type:

15 Architecture: # / material / type: 1 W AK

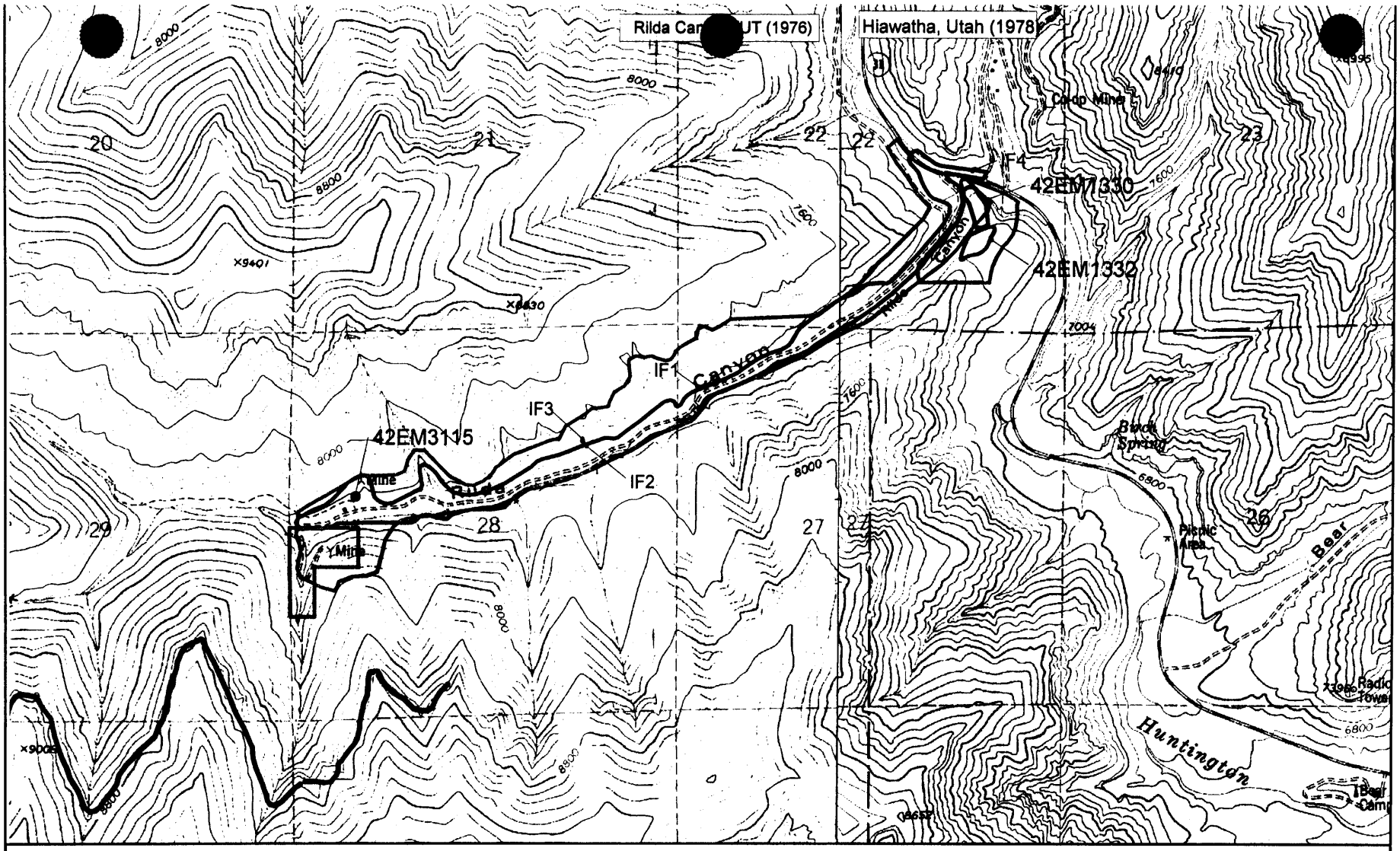
Printed on 3/5/01 7:12:40 AM

Sketch Location of 42EM3115



No Artifacts with structure

SENCO-PHENIX



SENCO-PHENIX

N

Scale 1:24000
1"=2,000'

Previous Survey
Current Survey
Eligible Sites
Ineligible Sites

Rilda Canyon Mine
Energy West Mining Company
Emery County, Utah
Sections 22, 27, 28, T16S, R7E
September 2003
SPUT- 461

42EM3115

View North over Site

View Southeast over Interior of Site

R645-301-400 LAND USE & AIR QUALITY SECTION

MAPS

♦ **MAP 4-1: HISTORICAL MINE WORKINGS IN RILDA CANYON**

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

R645-301-500 ENGINEERING

TABLE OF CONTENTS

R645-301-510 INTRODUCTION 1

R645-301-511 GENERAL REQUIREMENTS 1

R645-301-511.100 GENERAL REQUIREMENTS 1

R645-301-512 CERTIFICATION 2

R645-301-513 COMPLIANCE WITH MSHA REGULATIONS AND MSHA APPROVALS 2

R645-301-514 INSPECTIONS 3

R645-301-514 EMERGENCY PROCEDURES 3

R645-301-520 OPERATION PLAN 3

R645-301-521 INTRODUCTION 3
- R645-301-521.110 Previously Mined Areas 4
- R645-301-521.130 Landowner and Right of Entry and Public Interest Maps 4
- R645-301-521.140 Mine Maps and Permit Area Maps 5
- R645-301-521.150 Land Surface Configuration Maps 5
- R645-301-521.160 Maps and Cross-Sections of the Proposed Features of the Proposed Permit Area 5
- R645-301-521.170 Transportation Facilities 5
- R645-301-521-180 Support Facilities 5
  - Sediment pond 6
  - Embankment Fills 6
  - Parking Lot 6
  - Underground Vehicle Parking Garage 7

Office/Bathhouse/Warehouse Building 7
Materials Storage Areas 7
Access and Service Roads 7
Mine Ventilation Fan 8
Water Treatment System 8
Culinary Water Storage Tank 8
Sewer Treatment System 8
Drainage System 9
R645-301-521.190 Signs and Markers Specifications 9

R645-301-522 COAL RECOVERY 9

R645-301-523 MINING METHODS 15
Continuous Mining Units 15
Longwall Mining System 16
Mine Production 18

R645-301-524 BLASTING AND EXPLOSIVES 18

R645-301-525 SUBSIDENCE 20
Subsidence Damage Probability Survey 20
Mining Methods and Subsidence 21
First Mining, "No Subsidence Restricted" Areas 22
1) Right Fork of Rilda Canyon 22
2) Mill Fork State Lease ML-48258 Access (Hiawatha Seam) 23
Subsidence Monitoring Plan 23
Aerial Photogrammetry 23
Special Monitoring 24
Mitigation of Subsidence Damage Effects 25
Subsidence Control 26
Public Notice 27

R645-301-526 MINE FACILITIES 27
R645-301-526.116 Mining Within 100 Feet of Public Road 34
R645-301-526.200 Utility Installation and Support Facilities 34

R645-301-527 TRANSPORTATION FACILITIES 34
North Rilda Canyon Portal Facility 36
1. Mine Service Road 36

2. Fan Access Road 36
3. Powder Magazine Access Road 36
Left Fork Rilda Canyon Access Road 36

R645-301-528 HANDLING AND DISPOSAL OF COAL, OVERBURDEN, EXCESS SPOIL, AND COAL MINE WASTE. 42

R645-301-530 OPERATIONAL DESIGN CRITERIA AND PLANS 43

R645-301-532 SEDIMENT CONTROL 44

R645-301-533 IMPOUNDMENTS 44

R645-301-534 ROADS 44
Left Fork Rilda Canyon 44
North Rilda Canyon Portal Facilities 45

R645-301-535 SPOIL 45

R645-301-536 COAL MINE WASTE 45

R645-301-540 RECLAMATION PLAN 46

LIST OF APPENDICES

Appendix A	Ground Stability Analysis: 4/5th North Mains Crossing of the Right Fork of Rilda Canyon
Appendix B	Correspondence Letters
Appendix C	Environmental Assessment for Deer Creek Mine North Rilda Extension
Appendix D	Decision Notice and Finding Of No Significant Impact
Appendix E	DOGM Letter - Consent to Conduct Mining
Appendix F	North Rilda Canyon Portal Facilities Geotechnical Investigation

LIST OF FIGURES

500a	Typical Main Entry and Panel Development
500b	Typical Longwall Panel Retreat

LIST OF MAPS

5-1	North Rilda Canyon Portal Facilities: Pre-Disturb Topography
5-2	North Rilda Canyon Portal Facilities: Surface Facilities Map
5-3	North Rilda Canyon Portal Facilities: Cross Sections (2 Sheets)
5-4	North Rilda Canyon Portal Facilities: Cross Sections Fan Access Road & Fan Pad
5-5	North Rilda Canyon Portal Facilities: Cross Sections Explosive Magazine & Access Road

R645-301-510 INTRODUCTION

Coal mining has occurred since 1946 in Deer Creek Canyon, a tributary of Huntington Canyon in Emery County, Utah. Utah Power & Light Company (now PacifiCorp) purchased the operations and coal leases from Peabody Coal Company in 1977. The Deer Creek Mine portal, mine personnel, and its coal handling facilities are located in Deer Creek Canyon.

Mining in the North Rilda Area will continue in the ~~Blind Canyon and~~ Hiawatha coal seam~~s~~. Approximately 23 million tons of minable coal is anticipated to be mined from the North Rilda Area during life-of-mine production. Because of the need to expand the mining operations to the northeast (Mill Fork State Lease #48258), surface facilities are required in Rilda Canyon. This includes all support facilities for underground mining operations except coal transportation.

A variety of engineering principles and techniques are applied in the Deer Creek Mine operation. Principles of engineering employed are those associated with standard prudent mine engineering practices. More detail about the methodologies used to plan the coal mining activities for long-range goals at the Deer Creek Mine and the use of computer assisted models can be found in Volume 2, Part 3 of the MRP.

R645-301-511 GENERAL REQUIREMENTS

This document will include the general requirements to meet the State of Utah's regulatory requirements to mine coal in the North Rilda Area and operate surface facilities in Rilda Canyon as part of the Deer Creek Mine. The proposed ~~new mining~~ surface facility operation plan will include new information or reference the existing mine plan when appropriate. The potential impact to the environment will also be addressed. As reflected by its format, much of the current Deer Creek MRP was written prior to the State's R645- Rules. This amendment to the plan attempts to follow the Rules general format, yet allow it to also be consistent with the existing MRP.

R645-301-511.100 GENERAL REQUIREMENTS

Rilda Canyon Portal Facilities and Operations

Early mining operations occurred near the proposed surface facilities (see Map 5-1). These operations include the Romminger (Ferrell) Mine, Jeppson Mine, Leroy Mine (Comfort), and Helco Mine. Mining occurred in these mines in the 1940's and early 1950's. Abandonded Mine Lands (AML) reclaimed these mines in 1988. Much of the proposed disturbed surface area of the

Rilda Canyon facilities will occur within the Leroy, Romminger, and Jeppson mines disturbed area.

Surface facilities in Rilda Canyon includes the existing mine fan, substation and water supply in the Left Fork of the canyon, and surface related facilities associated with the proposed Rilda Canyon Portal Facilities including; bathhouse/office/warehouse, underground vehicle parking garage, fuel dock, water and sewer stations, rock dust silo, employee parking area, fan, sediment pond, covered and open storage area, etc. The proposed Rilda Canyon Portal surface facilities are located approximately 160 feet below the Hiawatha Seam. To access the seam from this location, a 2000 foot rock slope is proposed to be constructed through the Star Point Sandstone. Refer to Section R645-301-521 for a detailed description of all proposed surface facilities planned for the North Rilda Canyon access to the Mill Fork Lease. Also refer to Volume 12 of the Deer Creek MRP for detailed information of the mining plan, mining production, and mining methods that will be utilized within the Mill Fork Lease.

R645-301-512 CERTIFICATION

Applicable cross sections and maps have been included or referenced within this document. They have been prepared by, or under the direction of, and certified by a qualified, registered, professional engineer or land surveyor, with assistance from experts in related fields such as hydrology, geology and biology.

R645-301-513 COMPLIANCE WITH MSHA REGULATIONS AND MSHA APPROVALS

Because the area is a permitted coal mine, existing coal processing waste dams, embankments, impoundments, sediment ponds, and refuse piles comply with all MSHA regulations governing them. ~~No~~ All additional structures that are proposed for mining in the North Rilda Area and the Mill Fork Lease will comply with all regulation, whether local, State, or Federal.

Underground development waste, coal processing waste and excess spoil will continue to be disposed of in accordance with plans approved by DOGM and MSHA. There are no plans to return coal processing wastes to the underground workings at Deer Creek Mine. All coal will be shipped via beltline through the Deer Creek Canyon portals.

R645-301-514 INSPECTIONS

All appropriate engineering inspections and reports will be conducted by a qualified registered professional engineer or other qualified professional specialist under the direction of the professional engineer. Excess spoil material will be generated during the construction of the 2100 foot slope to access the Hiawatha coal seam above the mine facilities pad. Excess spoil will be utilized as a fill material for the construction of the mine facilities pads. The spoil will be placed in a controlled manner to ensure mass stability and prevent mass movement during and after construction. Excess spoil will meet the design criteria of R645-301-535. See this section for detailed design.

R645-301-514 EMERGENCY PROCEDURES

In the event any potential hazard exists, develops, or occurs in association with slides and/or impoundment structures which may have an adverse effect on the health and safety of the public, property, or the environment, DOGM will be promptly notified. The operator commits to comply with any remedial measures required to protect and ensure the health and safety of the public.

The Deer Creek Mine facility conducts routine inspections on a weekly basis. Should a hazard exist or occur, personnel have been instructed to notify the Mine Manager, who will coordinate and implement any emergency procedures and remedial measures to be taken.

Where temporary cessation of operations is necessary for a period beyond 30 days, the applicant will submit the proper notification and information required of R645-301-515.300 to DOGM.

R645-301-520 OPERATION PLAN

R645-301-521 INTRODUCTION

The plan for the mining in the North Rilda Area includes or references maps, cross sections, narratives, descriptions, and calculations indicating how the relevant requirements are met. The plan describes and identifies the lands subject to coal mining and reclamation over the estimated life of the operations and describes the size, sequence, and timing of the subareas for which it is anticipated that individual permits for mining will be sought.

For review of the mining plan of the Mill Fork Lease area, refer to Volume 12, Mill Fork Lease, ML-48258.

R645-301-521.110 Previously Mined Areas

Areas previously mined ~~at the Deer Creek Mine are shown in Vol. 4, Map 1-3.~~ in the North Rilda Area is presented on the Surface Facilities Map (Map 5-2) in Maps Section. These areas include the Leroy Mine, Rominger Mine, Jeppson Mine, and Helco Mine. Mining occurred in these mines in the 1940's and 1950's. Abandoned Mine Lands reclaimed these sites in 1988.

~~Support Facilities~~

~~Surface facilities of the Deer Creek Mine in Rilda Canyon include the following: sediment pond, embankment fills, coal surge bin, transfer tower, breaker station, crusher station, coal weigh bin, truck load-out facility, conveyors, overland conveyor, parking lot, parking garage, office/bathhouse/warehouse-shop, materials storage area, access and service roads, mine ventilation fan, power supply and substation, water treatment system, high pressure pumphouse, water storage tank, sewer treatment system, and drainage system (see Vol. 5, Maps 3-9 and 3-9A).~~

~~Another support facility of the mine is located in Rilda Canyon. This facility includes an access road and a pad area which supports two portals, a substation, power line, fan, water storage tank, and pumphouse. Topsoil removed prior to construction of the site is also stored within the permit area of the Rilda Canyon facilities. Additional information about this facility is provided in Vol. 2, Part 3 and Vol. 5, Map 3-9A.~~

~~An off-site support facility of the mine is the Deer Creek Waste Rock Storage Facility located northeast of the mine site, near State Highway 31. See Vol. 10 of the MRP for more details of the Deer Creek Waste Rock Site. Additional information about all support facilities at the Deer Creek Mine is included in Section 526 of this document.~~

R645-301-521.130 Landowner and Right of Entry and Public Interest Maps

Refer to Supplemental Volume (Legal and Financial Information) and also Volume 4 maps 1-1 and 1-2.

R645-301-521.140 Mine Maps and Permit Area Maps

The boundaries of the North Rilda area proposed to be affected for the life of coal mining and reclamation activities is found on map DU1688 in Appendix A. Refer to Volume 12, Mill Fork Lease ML-48258 to review all proposed affected areas in the Mill Fork Lease.

R645-301-521.150 Land Surface Configuration Maps

Plan views and cross-sectional maps for existing and proposed land surface configuration for the coal mining and reclamation operations in the North Rilda Canyon area are found on maps 5-1 through 5-4.

For the Left Fork Rilda Canyon fan facilities, refer to maps 3-9A and 3-9B in Volume 5.

R645-301-521.160 Maps and Cross-Sections of the Proposed Features of the Proposed Permit Area

In accordance to R645-301-521.160, surface facilities are shown on each plan view map. The maps clearly show the location of all facilities necessary to conduct coal mining and reclamation operations within the proposed permit area.

R645-301-521.170 Transportation Facilities

Primary and secondary roads are described in detail in Section R645-301-527. Each road is shown on their respective surface facility map.

R645-301-521-180 Support Facilities

Surface facilities in Rilda Canyon are located at two loctions;

Left Fork of Rilda Canyon: This facility includes an access road and a pad area which supports two portals, a substation, power line, fan, water storage tank, and pumphouse. Topsoil removed prior to construction of the site is also stored within the permit area of the Left Fork Rilda Canyon fan facilities. Additional information about this facility is provided in Volume 2, Part 3 and Volume 5, Map 3-9A.

Rilda Canyon Portal Facilities: This facility includes the following; sediment pond, embankment fills, parking lot, underground vehicle parking garage, office/bathhouse/warehouse building, materials storage area, access and service roads, mine ventilation fan, power supply, water

treatment system, water storage tank, sewer treatment system, and drainage system (see Volume 5, Maps 3-9 and 3-9A and Map 5-3 in this chapter). A short discussion of each facility is discussed below:

Sediment pond - Preliminary plans for the Rilda Canyon Facilities include construction of single sedimentation pond located at the eastern extent of the disturbed area (refer to Map 5-3). Analysis utilized to determine the size and hydraulics related to the construction and operation of the sedimentation pond are included R645-301-700 Appendix B: Drainage and Sediment Control Plan.

Embankment Fills - A geotechnical investigation for preliminary design of the Rilda Canyon Portal Facilities is scheduled for November 2003. This investigation will be used to by an engineering firm retained to design facilities; the concept of which, as depicted on Map 5-3.

The purpose of the study is to define the characteristics of the surface and subsurface material in the area of the new facilities. This analysis will include structure and foundation recommendations for the facilities located on the cut and fill areas of the pads. Recommendations for the new construction need to be specified to assist the project Architect, Engineer and Contractor in proper design and construction. Also included in the recommendations are methods used during construction to handle foundations on areas of native soil, native fill and fill from the excavated underground access slope.

Preliminary design recommendations regarding cut slopes will be presented in the report (refer to Appendix E). The proposed facilities will be designed in accordance with the most conservative recommendation, which should result in a stability safety factor of a least 1.3. Information will be obtained through drilling immediately upon accessing the area. Slope stability analysis, based upon results of the geotechnical investigation, will be performed on the proposed slopes. Final slope configurations were designed to the minimum 1.3 safety factor.

Parking Lot - Two general parking areas are proposed the Rilda Canyon Portal Facilities. Construction consists of an average 6" road base with 4" of asphalt surface. One small lot is located just outside the office-bathhouse with spaces designated for 19 vehicles. The main parking lot in the mine yard has 138 designated parking spaces.

Parking lots will be cleared of snow and debris and resurfaced as needed. When snow removal from the mine site is necessary due to heavy snowfall and accumulation, it will be stored in designated locations or transported and stored at the Waste Rock Site in a controlled manner so that it will drain into the sediment basin.

Underground Vehicle Parking Garage - a 120' x 70' steel frame structure with a concrete floor, aluminum siding and roofing will be located adjacent to the bathhouse. These structure will used as a staging area and parking for underground vehicles.

Office/Bathhouse/Warehouse Building - Mine offices and bathhouse facilities are housed in a 120' x 72' two story, pre-fab concrete building. Offices for administrative, clerical, safety and engineering personnel will be included in this building with conference rooms and bathroom facilities. Locker rooms, showers, bathrooms, and lamp room for 250 miners and supervisors occupy the bulk of the building. Standard building maintenance procedures are followed to maintain the office-bathhouse.

Materials Storage Areas - Mine support materials and equipment are sorted in graveled or asphalt surface areas on the cut or embankment fills. Primary material storage surrounds the parking agarge and includes a non-coal waste storage, coal waste storage, oil storage, fuel facilities and bulk rock dust. A secondary storage area is located east of the main parking lot and includes sand/salt storage and open storage. Materials stored in open areas include crib blocks, roof bolts, conveyor hardware, belts, beams, etc..

Adjacent to the sand/salt storage area is a 40' x 80' steel frame storage shed. This covered storage shed will provide shelter for bagged rockdust and ready-mix concrete.

Oil storage and fueling facilities are located adjacent to the underground vehicle parking garage. Cans of oil and lubricant are housed in a steel storage shed. Diesel fuel will stored in a 4,000 gallon above ground tank and accessed with an electric pump.

A 140 ton capacity steel rock dust bin is located near the non-coal waste bunker. The bin will be mounted on a concrete foundation. Rock dust will be pumped into specially equipped cars for distribution in the mine.

A Sand/Salt Storage Shed (45'x24') will be located east of the covered storage shed. The shed is covered and stores de-icing materials for winter road maintenance.

Access and Service Roads - The North Rilda Canyon portal facility main service road is proposed parallel to Emery County Road #306 and is approximately 1,600 feet in length. The road will be designed in accordance with recommendations from the Emery County Road Department. The mine access will be asphalt surfaced. Road gradient averages approximately 5%. Drainage from the mine access road will collected in an open ditch in the "disturbed" drainage system.

The fan access road is a located behind the main portal pad and extends to the mine ventilation fan. Road gradient averages approximately 13%. Travel on this road will be limited to once a day at low speed. Road width averages 12 feet. Drainage from the mine fan access road is collected in an open ditch in the "disturbed" drainage system.

Access to the intake portal (rock slope) will be from the underground vehicle parking garage pad to the portal with a gravel surfaced road with an average travel width of 30 feet an average grade of approximately 8%.

Mine Ventilation Fan - The fan installation at the North Rilda Canyon portal facility is a dual, parallel fan arrangement (refer to Map 5-3). The fans are located side-by-side on concrete foundations. The exhaust evases are directed upward to reduce environmental impacts. Only one fan will operate at a time. The main fan is driven by an electrical motor and the back-up fan is powered by a diesel motor. The motors are housed in steel frame buildings. The fan housing structure and buildings were painted as directed by the Manti-LaSal personnel, to be compatible with the surrounding area. Fuel for the back-up fan is stored in an above ground storage containment system inside a bermed area near the fan.

Power Supply - A 25KV power line provides electrical power to the substation at the Left Fork Portal Facility. The power line was installed by a contractor in accordance with a Forest Service Special Use Permit issued to Utah Power (refer to Volume 5 Map 3-9A). A drop structure to provide power to the North Rilda Canyon portal facility will be designed and constructed as specified with poles and cross-member structures are consistent with the raptor protection design criteria.

Water Treatment System - Culinary water treatment and distribution system will incorporated into the office/bathhouse facility. The design and construction of the water treatment facility will meet the specification of the State of Utah Division of Drinking Water.

Culinary Water Storage Tank - A steel water storage tank will located on the facility pad area provide secondary storage of culinary water. Size and location will determine based upon the geotechnical investigation and engineering design of the facilities.

Sewer Treatment System - Office/Bathhouse sewage will be collected in two five thousand (5,000) gallon precast concrete septic tanks located in the mine yard. The septic tanks will be connected in series. Effluent from these tanks will be carried by a pipeline to storage/transfer system consisting of two twenty thousand (20,000) gallon tanks for temporary storage. The temporary storage tanks will be pumped as needed and transferred to an approved facility. The sewer treatment will be designed to fulfill local, state and county health codes.

Drainage System - Two separate drainage systems will be provided at the North Rilda Canyon portal facility site and will classified as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects water above the portal site and from side slopes adjacent to the site and will convey it past the disturbed area into the natural channel of Rilda Canyon Creek.. The "disturbed" collection system collects runoff from portal area, parking lots, storage areas and bathhouse area and will convey it to the sedimentation pond. For complete details pertaining drainage refer to R645-301-742.300.

R645-301-521.190 Signs and Markers Specifications

Permit area identification signs will be placed and maintained at each point of access from public roads. Signs will show the business name, address, telephone number, and DOGM identification number.

Perimeter markers will be placed around all disturbed areas of the North Rilda Canyon portal facilities and Left Fork Rilda Canyon fan facilities. Perimeter signs will be placed at a reasonable sight distance from one another.

Areas along the Rilda Canyon perennial stream (100 feet above and below disturbed area of the North Rilda Canyon Portal Facilities) will be considered a buffer zone and will be appropriately posted.

Topsoil and subsoil storage areas will be appropriately posted to identify these piles. A silt ferce will be used to prevent topsoil and subsoil eroding from the site.

R645-301-522 COAL RECOVERY

This section includes a description of the mine plan and measures to be used to maximize the use and conservation of the coal resource. The description attempts to show that coal mining and reclamation operations are conducted to maximize the utilization and conservation of the coal, while utilizing the best technology currently available to maintain environmental integrity. This decreases the likelihood of re-affecting the land in the future through coal mining and reclamation operations. Coal Recovery in the Mill Fork area is included in Volume 12, Mill Fork Lease, ML-48258 of the Deer Creek MRP.

Mine Plan: Access to the to North Rilda reserves was achieved with the use of 5-entry set of mains referred to as 4th North Mains. The 4th North Mains are developed northwest (approximately 4000 feet) from the 4th North / 10th West Mains intersection. Mainline development, designated as 5th North, then changed course to a northeast bearing, with

development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 maps HM-9, HM-10 and HM-12~~1~~). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the bedrock interface. Based upon the results of the surface exploration program, mining below the Right Fork of Rilda Canyon was re-located approximately 800 feet to the west of the original projection. Re-location of the mains to the west increased the overburden from approximately 120 to 200 feet.

Based on the information gained from the surface exploration program , a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

From the 4th North/5th North intersection, mainline development ~~will~~ proceeded to the northern boundary of Federal Coal Lease U-024317. Longwall gateroad development sections ~~will be~~were driven due east from the 5th North Mains to the extent of mineable reserves. Six longwall panels were completed in the Blind Canyon Seam, and six longwall panels are projected in the Hiawatha Seam. Sequence of longwall panels extracted in the Blind Canyon Seam were as follows:

Blind Canyon Seam:

Longwall Panel	Coal Lease	
11th East	Federal Leases	U-06039
		U-024317
	PacifiCorp patent fee claims	
12th East	Federal Leases	U-06039
		U-024317
	PacifiCorp patent fee claims	
14th East	Federal Leases	U-06039
		U-024317
	PacifiCorp patent fee claims	
15th East	Federal Leases	U-024317
9th East	Federal Leases	U-06039

		U-024317
		SL-051221
		U-2810
	PacifiCorp patent fee claims	
8th East	Federal Lease U-06039	
	Federal Lease SL-051221	

Hiawatha Seam Access: Access to the to North Rilda Hiawatha seam reserves was achieved with development of rock slopes and vertical shafts ~~room~~from the Blind Canyon seam to the lower seam. From the bottom of the slopes, a 5-entry set of mains referred to as 6th North Mains were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right. The sequence of longwall extraction will be as follows:

Hiawatha Seam:

Longwall Panel	Coal Lease	
5th Right	Federal Leases	U-06039
		U-024317
	PacifiCorp patent fee claims	
4th Right	Federal Leases	U-06039
		U-024317
	PacifiCorp patent fee claims	
3rd Right	Federal Leases	U-06039
		U-024317
		SL-051221
		U-2810
	PacifiCorp patent fee claims	
2nd Right	Federal Leases	U-06039
		SL-051221
		~~U-2810~~
7th Right	Federal Leases	U-06039
		U-024317
	~~PacifiCorp patent fee claims~~	
8th Right	Federal Lease U-06039	
	Federal Lease U-024317	
	~~PacifiCorp patent fee claims~~	

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 56-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to Volume 5 Map 3-7).

North Rilda Canyon Portal Facility Access: Based on data acquired through in-mine directional drilling program, Energy West developed a mine plan to access the North Rilda Canyon Portal Facility area with a set of three entry submains referred to as 1st Right, driven east from the 1st South submains to the Hiawatha coal outcrop near the reclaimed Leroy Mine portals. A fan portal will be constructed at this location. In addition, intake and travel access to the mine will be accomplished by constructing a portal and rock slope from the surface. The slope will be constructed at the elevation of the mine facilities pad and sloped upward at 8% for approximately 2100 feet to the Hiawatha coal seam. The dimensions of the portal will be a 20' x 9' foot rectangular opening. Mine equipment and men will use this portal to access the northern part of the Deer Creek Mine.

Based on the current layout, the two northern and two southern panels of each seam are projected to extend below the Castlegate Sandstone escarpment. As specified in the lease stipulations, "except at specifically approved locations, the Castlegate escarpment must be protected from mining induced failure". Due to the limited surface exposure of the Castlegate Escarpment, no special monitoring of environmental assessment was deemed necessary for the northern panels. An environmental analysis for full extraction longwall mining beneath the Castlegate Sandstone escarpment has been completed for the two southern panels with an accompanying Decision Notice/FONSI signed (R645-301-500: Appendix C and D). The environmental analysis assessed the following:

a. How much escarpment could fail based on analytical methods, observation of similar areas, geologic/topographic conditions, and panel orientation.
b. What resources would be affected by escarpment failure and description of the nature and magnitude of these effects, ie: vegetation; wildlife and habitat; threatened / endangered and sensitive species; cultural and paleontological resources; hazards; visual quality; etc.

The Castlegate Sandstone escarpment within the North Rilda Permit Application area has been defined in the permit application in two (2) distinct portions:

- *NORTH CASTLEGATE ESCARPMENT - NORTH RILDA AREA*
- *SOUTH CASTLEGATE ESCARPMENT - NORTH RILDA AREA*

NORTH CASTLEGATE ESCARPMENT: The Castlegate Sandstone escarpment within the northern portion of the North Rilda Area (north face of the ridge) has very limited surface exposure due to the presence of talus slopes and forest vegetation which cover most of the escarpment in this area. Due to the limited surface exposure of the Castlegate escarpment, no special monitoring or mine layout protection is planned for the escarpment in this area, i.e.; the four (4) northernmost longwall panels in the Blind Canyon and Hiawatha Seams - North Rilda Area, refer to R645-301-500: A for complete description and comparison of the North Castlegate Escarpment to previously mined areas.

SOUTH CASTLEGATE ESCARPMENT: The Castlegate Sandstone escarpment within the southern portion of the North Rilda Area (south face of ridge) has a prominent surface exposure. Based on an on-going geotechnical study evaluating the potential effects of longwall (full-extraction) mining on the stability of the Castlegate escarpment, i.e.; Cottonwood Newberry Canyon/Corncob Wash and Trail Mountain 5th East/Cottonwood Canyon Test Areas, on going development of a predictive escarpment/mining model is in progress. The current model developed from these studies was used to forecast anticipated effects of proposed mining under the escarpment within the southern portion of the North Rilda Area, ie: The two (2) most southern longwall panels proposed in the Blind Canyon and Hiawatha Seams - North Rilda Area, refer to R645-301-500: Appendix A for complete description of the Geotechnical Study.

Coal Recovery: The maximum amount of economically recoverable coal will be extracted from the North Rilda Area of the Deer Creek Mine with the exception of protective coal barriers which must be left in place to ensure the integrity of the mine entries associated with the active underground workings and to protect environmentally sensitive surface resources within the Rilda Canyon Fork Area (See R_2P_2 Mine Plan Map [Volume 5, Map 3-6 & 3-7]). These protective coal barriers can be broken into five (5) separate categories:

(1) **Property Boundary Barriers:** All external property boundary lines are protected by a 50 foot (minimum) solid coal "buffer" barrier.

(2) **Protective Main Entry Barriers:** Protective main entry barriers are designed to protect long term mine entries from excessive abutment pressures of the retreating longwall. Design of these barriers are based on (I) intended duration of use, (ii) depth of cover in the area, (iii) geologic conditions present, and (iv) historical performance of similar sized barriers in similar conditions.

(3) **Bleeder Entry Barriers:** Bleeder entry barriers are designed to insure the long term stability of the longwall panel bleeder system. Design of these barriers is based on (I) intended duration of use, (ii) depth of cover in the area, (iii) geologic conditions present, and (iv) historical performance of similar sized barriers in similar conditions. Evaluation of localized conditions at the time of development, in conjunction with the preceding design parameters, will be on-going to determine final barrier sizing so that bleeder entry stability and coal recovery may be optimized.

(4) **Surface and Sub-Surface Resource Protective Barriers:**

(a) In-place coal will be left within the Rilda Canyon fork area to insure the long-term stability and integrity of environmentally sensitive surface and sub-surface resources.

(b) In-place coal will be left within the Mill Fork Access area to ensure the long-term stability and integrity.

(5) **Mining Below the Right Fork of Rilda Canyon**: A portion of the right fork of Rilda Canyon lies within the proposed North Rilda Area Permit Application of the Deer Creek Mine. Due to the environmental sensitivity of the Right Fork area (specifically the sub-surface hydrologic alluvial system and associated surface riparian vegetation zone), a complete analysis of a proposed "no-subsidence" design of the 5th North Mains development within the area of the right fork of Rilda Canyon has been prepared addressing the long term ground stability and subsidence protection of the area with regards to proposed mining. All pre-mining and post-mining conditions have been evaluated based on the best geologic and engineering information currently available (refer to R645-301-500 Engineering Section: Appendix A).

The 4th North Mains~~, as projected,~~ consists of a 5-entry development section, bearing northwest from the Deer Creek 10th West Mains. Initial location of the 10th West/4th North intersection was based on the following:

(a) Existing Blind Canyon seam conditions encountered in 10th West Mains development.

(b) Proximity to the projection of the Mill Fork Fault Graben.

(c) Most practical access route to the North Rilda - Blind Canyon and Hiawatha coal reserves, across the North Rilda Canyon Forks area.

A complete analysis of the location and long term ground stability of the 4th North / 10th West Mains and the Left Fork of Rilda Canyon was prepared and submitted by PacifiCorp to the BLM on November 15, 1996. Approval to proceed with relocation and development of the 4th North Mains was given by the BLM (per letter) February 13, 1997.

With regard to PacifiCorp's North Rilda Area Permit Application, the 4th North Mains were originally projected to be developed northwest (approximately 3000 feet), from the 4th North / 10th West Mains intersection. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. Based on the information gained from the surface exploration program , a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of long term entry stability for the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

It is expected that recovery rates of 85% can be obtained within the proposed longwall panel areas. The overall minable reserve recovery for the North Rilda Canyon area of the Deer Creek Mine is estimated at approximately 65%. In addition to the protective barriers listed above, Energy West has no plans on recovering coal pillars remaining gateroad and mainline development entries.

The Deer Creek mining plan is based on the geologic information of the area obtained from outcrops, drilling, and previous mining by the operator. For geologic information of this area, refer to R645-301-600 and Volume 8 of the MRP.

R645-301-523 MINING METHODS

The following is a description of the mining operation proposed to be conducted during the life of the mine within the North Rilda Canyon Area, including the methods of coal mining, engineering techniques, and anticipated annual and total production of coal.

Continuous Mining Units (Main Entry and Longwall Section Gateroad Development):

The principal purpose of the continuous mining units within the North Rilda Area of the Deer Creek Mine is underground mine development (i.e. section development of mainline entries, longwall section gateroad development, and longwall section setup/bleeder entry development; along with development of mine water holding sumps, rock storage rooms, etc.).

Figure R645-301-500a (~~attached~~fFigure Tab) illustrates the basic configuration of a typical five-entry mains, consisting of (nominal) 20 feet wide entries and crosscuts driven on standard 80 feet x 100 feet pillar centers. The pillars created measure a (nominal) 60 feet wide x 80 feet long; a size which has been developed for sufficient support of the main entries and overlying strata.

A variation to this typical configuration was utilized for the development of main entries underlying the crossing of the Rilda Canyon Right Fork Area. These five-entry mains consist of (nominal) 20 feet wide entries and crosscuts driven on 80 feet x 130 feet pillar centers. To eliminate multiple intersections in the stream crossing area, crosscut locations were staggered. The pillars created measure a (nominal) 60 feet wide x 110 feet long; a size which improves long term main entry stability and overlying strata stability through an area of hydrologic and surface resource concern.

Figure R645-301-500a also illustrates the basic configuration of a typical two-entry longwall panel development, consisting of (nominal) 20 feet wide entries and crosscuts driven on (nominal) 50 feet x 100 feet pillar centers. With the retreating longwall mining system, all panel development work is accomplished by continuous mining units prior to longwall installation.

Longwall Mining System:

The predominant mining method to be used in the North Rilda Area of the Deer Creek Mine will be *Longwall Retreat Mining*. This method, as practiced by PacifiCorp, presents the safest and most efficient underground resource recovery mining method available.

As referenced above, the two-entry gateroad system is developed with (nominal) 20 feet wide entries and crosscuts driven on (nominal) 50 feet x 100 feet pillar centers. This type of "yield pillar" configuration is designed so that the gateroad pillar will gradually yield as longwall retreat proceeds from panel to panel. The purpose of this design is to prevent the buildup of unrelieved stresses within the pillar.

Figure R645-301-500b (Figure Tab) illustrates the basic configuration of a retreating longwall system. After gateroad entries are driven to the extent of the longwall panel length, on both sides of the longwall panel, setup and bleeder entries are driven to connect the gateroads. A solid coal barrier is left between the setup and bleeder entries, size based on; (1) intended duration of use, (2) depth of cover in the area, (3) geologic conditions present, and (4) historical performance of similar sized barriers in similar conditions.

Longwall face width, depending on the geologic parameters of the coal deposit, varies from 500 feet to 1000 feet wide. Standard face width is 750 feet center to center (from center-line of head-gate belt entry to center-line of tailgate entry), or 730 feet coal block width. Once installed in the setup entry, the longwall begins retreat mining (from the setup entry "outby" toward the main line entries). A protective barrier is left between the mined out longwall panel (extraction face) and the main line entries that is sized to insure long term main line entry stability.

Panels are designed within the mining area, bounded by natural and imposed limits, with varying degrees of confidence as to final location and extent. Faults may vary somewhat from currently assumed locations. Geologic limitations such as seam splits, channel scours, spars, stratigraphic thinning, burned coal areas, etc. may affect resource recovery by varying the mining limits by hundreds of feet as information becomes available and as mining recovery economics and practicality are further refined. Regulatory mining restrictions, such as escarpment protection barriers and perennial stream buffer zones further confine mining extent.
The anticipated production will be obtained by utilizing two to three continuous mining units and one longwall mining system. The Deer Creek Mine presently operates two continuous mining units and one longwall mining system.

The North Rilda Area of the Deer Creek Mine will be developed with mains and sub-mains which support a series of longwall mining panels. This system is very effective in extracting and maximizing coal recovery. Approximately 75% of the Deer Creek minable coal reserve will be extracted by longwall mining systems, 25% will be extracted by continuous miner development.

The extracted coal is sized in the Deer Creek coal handling facility and conveyed to the PacifiCorp - Huntington Power Plant, approximately two miles away. A portion of the coal is also transferred to the Cottonwood Mine loading facilities via underground conveyor belts and transfer shaft.

The interburden in the minable area where the two seams overlap averages about 80 feet. Multi-seam mining will be evaluated where in interburden thickness of 30 feet exist between the two seams.

The mine layout of the Deer Creek mine is illustrated in Volume 5, Maps 3-6 and 3-7. The drawings show an arrangement of longwall panels and development sections interconnected by systems of main and sub-main entries. This arrangement is predicated on geographical dedication of reserves, regulatory mining restrictions, available coal quality, and geologic information.

The planned mine development sequence accommodates longwall panels as the primary means of efficiently extracting the reserves. This will ensure the best possible means of maximizing reserve recovery while maintaining consistent coal quality and ground control. Volume 5, Map 3-6 and Map 3-7 shows the North Rilda Area. Table 3 (Vol 2, Part 3) provides the approximate number of acres affected by mining in five-year increments for the Deer Creek Mine.

Mine Production

It is expected that an average production rate of 1,150 tons/machine shift for continuous miners and 9,000 tons/machine shift for longwalls will be the production rate in the North Rilda Area. Table 4 (Volume 2, Part 3) of the MRP lists the anticipated annual and total production of coal at the Deer Creek Mine.

As noted above, a mining productivity of 1,000 tons/ continuous miner shift and 9,500 tons/longwall shift is attainable. This translates into two miner sections and one longwall section operating 2 shifts/day, 190 days/year in order to achieve the required coal output at full production.

All in-mine coal haulage is by belt conveyor. Of the total entries in the main entry system, at least one entry is dedicated specifically to the belt conveyor. All mine personnel and materials are transported underground by diesel equipment. Table 5 (Volume 2, Part 3) lists the major ancillary equipment used in Deer Creek Mine.

R645-301-524 BLASTING AND EXPLOSIVES

The Deer Creek Mine is a developed and producing underground mine. and there is no anticipated need for any blasting activities incident to the underground mining activities. However, if circumstances develop that require surface blasting activities, a plan will be initiated in accordance with DOGM regulations in R645-301-524.

R645-301-524.100 Blaster Certification

All surface blasting incident to underground mining operations will be conducted under the direction of a certified blaster. Blaster certifications will be kept at the blasting site during blasting activities.

A certified blaster and at least one other person will be present at the firing of a blast. The blaster will be familiar with the blasting plan and site specific performance standards (refer to Volume 3 Appendix VI for the approved plan)

R645-301-524.200

Submittal of blast designs for shots using more than 5 pounds of explosives will be made to the Division for approval prior to conducting surface blasting at the mine site. A schedule will be presented to the Division prior to conducting blasting activities. The blast design will be prepared and signed by a certified blaster.

R645-301-524.300

A pre-blasting survey will be conducted as needed.

R645-301-524.400

Blasting will be preformed during the construction of the mine site pads. The blaster will use audible signals to notify those in the vicinity immediately before the blast. No residents live within one-half mile of the proposed blasting site. All blasting will be conducted between sunrise and sunset.

R645-301-525 SUBSIDENCE

This section describes in detail the operator's plan to ensure minimal environmental impacts from mine-induced subsidence. The Operation Plan (Volume 2, Part 3) plus the Geology Section (Volume 8) present the detailed data on which the analytical approach for the subsidence control plan is based. The following subsections describe the principal factors involved in controlling subsidence impacts resulting from the proposed mining operations.

For subsidence control and monitoring information specific to the Mill Fork Lease, please refer to Volume 12, Mill Fork Lease, ML-48258 in the Deer Creek MRP.

Subsidence Damage Probability Survey

A survey has been conducted on that portion of East Mountain surface which could possibly be affected by the mining of coal from the North Rilda Area. It has been determined that there are renewable resources present in the area in the forms of springs, water seeps, grazing land, timber, and wildlife. There are no springs and seeps located above the projected mining activities in the North Rilda Area. The occurrence of the springs is discussed in the hydrology section of this document (Section 700) . Only two springs are located within the North Rilda permit area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 HM-9 ~~included with this submittal~~ for the location of the springs and Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix A for sampling sites and monitoring schedule). Most of the streams within the permit area are ephemeral and/or intermittent. Only the lower portion of Rilda Canyon Creek below the forks is considered perennial. The streams are fed by springs that emanate primarily in the North Horn Formation west of the permit boundary. Second mining, ie. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the Right Fork of Rilda Canyon and the long-term stability analysis refer to the Engineering Section R645-301-500 A. To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency

accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

The angle of draw of subsidence produced by full-extraction mining can be influenced by many factors. These include the size of the area mined, number of seams mined, fractures or faults in the overburden, adjacent mine workings, and adjacent areas of burned coal and clinker. If mine workings extend to an area of burned coal, experience has shown that the overburden stresses above the mined area can be transferred to the adjacent burned coal and clinkers which can cause the clinkered areas to fail. In this case, the angle of draw may appear to be very shallow, when the crushing of the clinkered areas are the source of subsidence outside the normal area of influence.

Faults can also influence the angle of draw. If mining occurs adjacent to an existing fault, the area of subsidence will follow the natural plane of weakness formed by the fault. In this case, the angle of draw will be the same as the dip of the fault.

Based on data collected by the U.S. Bureau of Mines and eighteen years of subsidence data collection on East and Trail mountains, the angle of draw is found to be between 0 and 15 degrees from vertical. In some limited areas, the angle of draw is greater than 15 degrees, but in every case, the angle is greater due to the influence of one of the other factors mentioned above.

For planning purposes, any barrier of protection left in the mine to protect surface features should use a 15 degree angle of draw unless one of the factors mentioned above is known to exist in the immediate area.

No structures such as cabins, fencing, water troughs, and stock ponds currently exist within the boundaries of the North Rilda Area. Moreover, there are no oil, gas or water wells located within the East Mountain property, nor are there any gas or oil pipelines.

Mining Methods and Subsidence

The operator intends to minimize surface effects of subsidence by adopting, wherever practical, the longwall mining method and mining the coal deposits as completely as possible. The areas within the mine limits not mined by the longwall method will be mined by continuous miner in development for the longwall system. Approximately seventy-five percent (75%) of the recoverable coal reserve will be mined by the longwall method, the remaining area will be mined by continuous miner units.

The longwall mining method allows almost total extraction of the mineral and induces caving of the immediate and upper roof strata. As the coal seam is extracted, the overlying strata caves rapidly. The caving process has been shown to propagate to within 100 feet of the surface in less than two weeks after mining. This was determined by a cooperative study conducted by the U.S. Bureau of Mines using Time Domain Reflectometry (TDR). In this study, a coaxial cable was cemented within a drill hole positioned near the center of the 14th West longwall panel in the Cottonwood Mine. As the caving of the strata occurred, the cable would shear or be stretched. The depth of the shears or stretches could be identified with instruments on the surface. The data collected from this study is contained in Volume 3, Appendix IV of the MRP. Surface subsidence has been observed within two months of the coal extraction. In most areas, the subsidence will stabilize within 2 years of mining.

It is the operator's intent to mine areas as wide and long as present mining technology or equipment allows in order to minimize the area which would be on the sloping edge of the subsidence trough. The pillars of support for the longwall gate roads have been designed on the yielding pillar principle so that they will yield to destruction. This has been proven in practice in the mines and therefore will not affect the subsidence trough.

The size of the support coal pillars used in mine planning for both the Blind Canyon and Hiawatha seams to ensure long term stability has been determined by basic calculation for the deepest expected cover (from prior mining practice in the area) and USBM study. Experience has also shown that, in multi-seam mining circumstance, columnizing main entry development pillars in both seams is essential for long term main entry stability.

Full extraction areas, by definition, are planned and can control subsidence in areas. It is anticipated that the planned subsidence will minimize impacts and result in a generally uniform lowering of the surface lands in broad areas, thereby limiting the extent of material damage to those lands and causing no appreciable change to present land uses and renewable resources. Subsidence prediction work has shown that the expected maximum planned and controlled subsidence will vary from zero to fifteen (0-15) feet, assuming that the total cumulative extraction from the two minable seams will not exceed twenty (20) feet.

First Mining, "No Subsidence Restricted" Areas

1) Right Fork of Rilda Canyon
First mining, (i.e. mainline development), has occurred below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th

North Mains development within the Right Fork of Rilda Canyon and the long-term stability analysis refer to the Engineering Section R645-301-500 Appendix A.

2) Mill Fork State Lease ML-48258 Access (Hiawatha Seam)
Access to the to North Rilda Hiawatha seam reserves was achieved with the development of rock slopes and vertical shafts from the Blind Canyon seam to the lower seam. From the bottom of the slopes, a 65-entry set of mains (referred to as 6th North Mains) were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right.

Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 5-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to Volume 5 Map 3-7).

Subsidence Monitoring Plan

The operator initially adopted a twofold approach to subsidence monitoring:

1) aerial photogrammetry,
2) on-the-ground monumentation.

After seven years of comparing the two types of surveys it was determined that both methods effectively document the amount of subsidence which has occurred; however, the aerial photogrammetry method has the advantage of showing more detail because more data points can be monitored with less effort. Therefore in 1987, with the concurrence of the State of Utah, Division of Oil, Gas & Mining (DOGM), the operator discontinued on-the-ground monumentation and now collects subsidence data solely by aerial photogrammetry.

The subsidence monitoring program, conducted since 1980, has produced data which not only document the amount of subsidence that has occurred but also allows the operator to predict the amount of subsidence that is likely to occur when mining in new areas. The detail of the data collected in years past is not included herein. If the reader desires to investigate past data, it can be found in the annual subsidence reports available in the offices of DOGM.

Aerial Photogrammetry

PacifiCorp's subsidence monitoring program is primarily based on aerial photogrammetry. A baseline photogrammetric survey was conducted in 1980 which includes over 12,000 elevations

measured on a 200-foot spacing grid. These elevations are then compared to elevations measured from the photographs taken annually in August. This method has proven to be the best way to collect subsidence data on East Mountain. In flat areas, with limited vegetation, the elevations can be read from the photographs with a precision of one-half foot. In steeper areas, where cliffs are present, the resolution becomes less reliable, and inaccuracies of greater than ten feet can occur. In steeper areas, photogrammetric monitoring can, and has been, augmented by conventional survey data. The applicant will maintain survey control aerial targets within the permit boundary necessary to allow the interpretation of coordinates on photos within ± 1 foot. Following this procedure the operator shall conduct annually an aerial photo survey of all areas which have been undermined. . The operator shall continue monitoring all areas undermined until it is mutually agreed by the operator and DOGM that the subsidence in a given area has become stable and no further monitoring is necessary. The findings of the survey shall be reported to DOGM annually in a summary report.

Special Monitoring - Castlegate Cliff Escarpment

North Castlegate Escarpment - North Rilda Area

The Castlegate Sandstone escarpment, within the northern portion of the North Rilda Area, has very limited surface exposure due to presence of talus slopes and vegetation that cover the formation in this area. Due to the limited surface exposure of the Castlegate escarpment, no special monitoring or mine layout protection measures are planned for the escarpment in this area (refer to R645-301-500: Appendix A for a comparison of the North Castlegate Escarpment to previously mined areas).

South Castlegate Escarpment - North Rilda Area

The Castlegate escarpment, within the southern portion of the North Rilda Area, has well established surface exposure. Based on an on-going geotechnical study of evaluating the potential effects of longwall (full-extraction) mining on the stability of the Castlegate Sandstone escarpment, i.e. Cottonwood Newberry Canyon/Corncob Wash and Trail Mountain 5th East Cottonwood Canyon Test Areas, development of a predictive escarpment/mining model was developed and presented to DOGM, USFS and BLM . The model developed from these studies was used to forecast anticipated effects of proposed mining under the escarpment within the southern portion of the North Rilda Canyon Area, i.e. two (2) southern-most longwall panels proposed in the Blind Canyon and Hiawatha Seams - North Rilda Area (See R_2P_2 Mine Plan Maps Vol 5, Maps 3-6 & 3-7). Based on the predictive escarpment/mining model, areas of potential cliff escarpment failure will be monitored with photogrammetric methods, augmented by conventional survey data. .

To comply with the special monitoring stipulation referenced in the environmental assessment, "Deer Creek Mine will also monitor subsidence through their mine plan requirements and as

proposed, provide higher resolution monitoring data for the North slope of Rilda Canyon by installing prisms for accurate surveying on the top of the escarpment", PacifiCorp installed a series of prisms in 1999 to document subsidence features of Castlegate escarpment (Refer to Map DU1688E in R645-301-500 section).

Prisms PR-1, PR-2, and PR-3 were installed in February 1999 prior to full extraction mining. Prisms PR-4, PR-5, and PR-6 were installed in June 1999.

All prisms will be monitored prior to mining to establish baseline values and percent error variations. During the mining process, prisms will be monitored daily until the movement stabilizes. Data from the prism monitoring will be reported in the Annual Subsidence report.

In addition to the prism monitoring, PacifiCorp will install warning signs in Rilda Canyon prior to undermining the two southern panels.

PacifiCorp did cooperate with the surface land management agency (U.S.D.A. Forest Service) in an environmental analysis of the potential impacts. Final mining approval of the referenced southern longwall panels was granted based on the objective evaluation of the predictive model and assessment of potential surface impact from full-extraction mining within the affected area. The environmental analysis is complete with the associated Decision Notice/FONSI signed on 11/1/99 (see R645-301-500 Appendix C and D in this section) and DOGM consent dated November 10, 1999 (R645-301-500 Appendix E).

Mitigation of Subsidence Damage Effects

Should significant subsidence impacts occur, the applicant will restore, to the extent technologically and economically feasible, those surface lands that were reduced in reasonably foreseeable use as a result of such subsidence to a condition capable of supporting presubsidence reasonably foreseeable uses.

In order to restore any land affected by operations to a condition capable of supporting the current and postmining land uses stated herein, the operator will replace water determined to have been lost or adversely affected as a result of operator's mining operations if such loss or adverse impact occurs prior to final bond release. The water will be replaced from an alternate source in sufficient quantity and quality to maintain the current and postmining land uses as stated herein.

During the course of regular monitoring activities required by the permit, or as the operator otherwise acquires knowledge, the operator will advise DOGM and the surface land management agency of the loss or adverse occurrence discussed above, within ten working days of having

determined that it has occurred. Within ten working days after DOGM notifies operator in writing that it has determined that the water loss is the result of the operator's mining operation, the operator will meet with DOGM to determine if a plan for replacement is necessary and, if so, establish a schedule for submittal of a plan to replace the affected water. Upon acceptance of the plan by DOGM, the plan shall be implemented. The operator reserves the right to appeal DOGM's water loss determinations as well as the proposed plan and schedule for water replacement as provided by Utah Code Ann. 40-10-22(3)(a).

As outlined earlier, there are no springs or seeps located above the projected mining activities in the North Rilda Area. Most of the streams within the permit area are ephemeral and/or intermittent. Only the lower portion of Rilda Canyon Creek below the forks is considered perennial. The streams are fed by springs that emanate primarily in the North Horn Formation west of the permit boundary. Second mining, ie. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the Right Fork of Rilda Canyon and long-term stability analysis refer to the Engineering Section R645-301-500 Appendix A. To protect the alluvial/colluvial system of the Right Fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

Subsidence Control

The operator will conduct the underground mining operations so as to prevent subsidence from causing material damage to the surface and to maintain the value and reasonable foreseeable use of that surface in accordance with the preceding subsidence control plan.

As mentioned in the PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION section, (728: Hydrologic Balance - Surface Water System), the drainages conveying runoff away

from the permit areas are streams in Rilda, and Mill Fork canyons. Second mining, ie. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 4/5th North Mains development within the Right Fork of Rilda and long-term stability analysis, refer to the Engineering Section R645-301-500 Appendix A. To protect the alluvial/colluvial system of the Right Fork of Right Fork of Rilda Canyon, a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the Right Fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

Public Notice

The operator will not mine in any areas that would allow potential subsidence effects (as indicated by the angle of draw) to affect any area outside of the lease and permit boundary until this constraint on coal recovery is resolved by OSM and BLM or permission is granted by the adjacent surface agencies. A mining schedule which details the area in which mining is to take place and the planned date of the mining activity has been submitted to the affected surface owners.

R645-301-526 MINE FACILITIES

Introduction

~~No new surface facilities are planned for the North Rilda Area. Coal production from the area will be transported by an underground conveyor belt system to the Deer Creek Mine facility.~~

The Deer Creek Mine includes two support facilities in Rilda Canyon:
~~There are also support facilities located in~~ Left Fork of Rilda Canyon, ~~a tributary of Huntington Canyon. The~~ facilities pad and access road ~~of this area~~ occupy approximately 2.01 acres of

Manti-La Sal National Forest land in the NW1/4, NW1/4, SE1/4 of Section 29, T16S, R7E, SLM. These facilities include an access road and a pad area which supports two portals, a substation, power line, fan, water storage tank, and pumphouse. Topsoil removed prior to construction of the site is stored within the permit area of the Left Fork Rilda Canyon fan facilities (see Volume 5, Maps 3-9 and 3-9A).

North Rilda Canyon Portal Facility is located on a ~~20~~ 10.2 acre site ~~at the junction of Deer Creek Canyon and Elk Canyon~~ approximately ~~3.5~~ 2.0 miles from the mouth of Rilda Canyon. The site is characterized by moderate vegetation and rugged, steep terrain. Surface facilities include the following: sediment pond, embankment fills, ~~coal surge bin, transfer tower, breaker station, crusher station, coal weigh bin, truck load-out, facility conveyors, overland conveyor,~~ parking lot, parking garage, office/bathhouse/warehouse ~~-shop~~, materials storage area, access and service roads, mine ventilation fan, power supply ~~and substation~~, water treatment system, ~~high pressure pumphouse,~~ water storage tank, sewer treatment system, and drainage system A description of each of these facilities area outlined in Section R645-301-521.180. A pre-disturbance topography map has been constructed to show the contour of the canyon prior to any construction activities. This map is found in the Maps Sections as Map 5-1.

526.110 - Existing Structures

As illustrated on the Surface Facilities Map, 5-2, the portal pad from the Leroy Mine will be utilized as the fan pad for a blowing ventilation system. The access road to the pad will be restored for travel by truck. The material on the existing pad will be removed to the sandstone outcrop. The fan facility will anchor directly to this foundation for a permanent secure site. The size of the pad and access road is approximately 0.91 acres

The pre-disturbed AML areas of the Leroy, Rominger, and Jeppson mines will be utilized for coal mining and reclamation activities for the proposed North Rilda Canyon portal facilities (refer to map 5-2). There is approximately 4.9 acres of previously disturbed area within these areas. The land configuration will be constructed as shown maps 5-2, 5-3, 5-4, and 5-5. Prior to any construction, topsoil will be stripped of to a depth of approximately 1.0 feet. Topsoil storage location is shown on Map 2-1 in the Soils Section and Map 5-2.

The mass balance tables for the facility pad earthwork are located on Map 5-3. They are divided up into 5 distinct areas: 1) The Upper Storage & Parking Garage Pad Area, 2) The Bathhouse/Office Pad Area, 3) The Lower Storage and Parking Lot Pad, 4) Fan Access Road, and 5) Powder Magazine Access Road. A summary of the earthwork quantities and balances is presented in the table below.

As mentioned above, a tunnel and slope is planned to access the Hiawatha Seam 160 feet above the portal facilities. The slope will be constructed at an approximate incline of 8%. It will be 2100 feet long covering a crossectional area of 20'wide x 9'high. This will generate approximately 14,000 bank cubic yards of additional fill material. Using an 80% swell factor and a 90% compaction standard and large rip-rap loss for replacement of this material results in 22,680 cy of available fill material. This spoil material will be place in a controlled manner according to R645-301-535.

The Access Road to the fan and the fan pad itself are located on the plan view (Map 5-2) and the cross sections on Map 5-4. The powder magazine access road cross-sections are located on Map 5-5. These two areas were previously disturbed by past mining activities and reclaimed by AML in 1988.

It is assumed that some structural material will have to be imported for the construction of the retaining systems. Assuming an average height of these structures of 12.5 feet, the corresponding width will be 10 feet. The length of these structures will be approximately 760 feet. This will require approximately 3,519 cy of imported structural fill material.

The volume occupied by the undisturbed culvert system is not accounted for in the cross-sectional drawings of 5-3 through 5-5. Approximately 3,818 cy of extra cut material will be available as fill for the construction of the mine facilities pads.

Deer Creek Mine - North Rilda Canyon Portal Facilities Earthwork - Mass Balance					
Area	Available Cut	Fill Needed	Volume Removed from Balance	Available Fill	Balance
1) Upper Storage and Parking Garage	12,153	(28,718)			(28,718)
2) Bathhouse	2,618	(5,290)			(19,236)
3) Lower Storage and Parking Lot	24,820	(26,269)			(20,685)
4) Fan Access	2,046	(1,767)			(20,406)
5) Powder Magazine	6,705	0			(13,701)
AML Topsoil*			7,905		(21,606)
Native Topsoil*			8,551		(30,157)
Imported Fill for Retaining Walls				3,519	(26,638)
Fill Volume Occupied by Culverts				3,818	(22,820)
Available Fill from Slope				22,680	(140)

* The topsoil material from the native and AML areas is subtracted from the earthwork mass balance. This material will be segregated and stored in a separate location and used for reclamation activities.

~~Vehicular access to the road is controlled by a locked barrier gate near the public turn-around area. However, the road continues to serve as a Forest Development Trail, allowing access by horseback and foot travel up the Left Fork of Rilda Canyon and beyond the facility area. Access to the facility pad is controlled with fencing and a locked gate at the point where the road enters the pad. The existing trail continues beyond this point.~~

~~Vehicular use of the road within the Rilda Canyon facilities will only occur in emergency situations, for environmental maintenance, and delivery of solid, bulk materials. Environmental maintenance will include transportation of men, materials, and equipment required to maintain, install, or remove structures that are necessary to comply with environmental laws and~~

~~regulations. Vehicular use of the road within Rilda Canyon was revised through proper permitting action via USFS, UDWR, and UDOGM approvals to allow the permittee to transport a maximum of 5.4 truckloads (tractor/trailer combinations utilizing forty foot trailers or ten wheel end dump trucks) per day of solid, bulk materials for usage in the North Rilda area of the Mine.. Access for routine equipment inspection and maintenance will be from underground. Surface environmental compliance inspections will be conducted on foot from the turn-around area. Snow removal will only occur in emergency situations and for delivery of solid, bulk materials. Should snow removal be necessary prior to December 1 or post April 15, snow removal will be accomplished by push, pickup, load and haul techniques. Snow volumes will be hauled to the Deer Creek Mine active waste rock site via ten wheel dump trucks and placed for proper treatment of the snow melt runoff. Side casting of snow into the Rilda Creek drainage or the adjacent road ditch will not be practiced.~~

~~The following typical materials could be shipped differently through the week to the Rilda Surface Facility:~~

~~Material/Activity~~	~~Vehicle Used~~	~~Loads/day*~~	~~Loads/Week*~~
~~Longwall Support CANS/Cribs~~	~~Tractor/Trailer~~	~~2~~	~~10~~
~~Gravel Products~~	~~End Dump~~	~~3~~	~~15~~
~~Omega Block (Palletized)~~	~~Tractor Trailer Flat Bed~~	~~.4~~	~~2~~
~~Environmental Maintenance~~	~~Misc.~~		~~<1~~
~~Total~~		~~5.4~~	~~28~~

~~* Maximum number of loads per/day or loads/week unless specific permission is requested and approved to transport additional material.~~

~~The following Stipulations will be observed during delivery of material and environmental maintenance:~~

~~**STIPULATIONS:**~~

~~1. Delivery of material Monday through Friday only.~~
~~2. Delivery of material during daylight hours only.~~
~~3. Immediate off loading of materials.~~

~~4. Storage of materials on surface limited to gravel products and "can" crib products in approved locations. Specific storage areas will be identified during the testing period. Proposed storage areas will be identified on the surface facility map.~~

~~5. Access gate to road to be closed and locked leaving the Rilda Surface Facility Access Road.~~

~~6. Material not to be delivered to Rilda Portal facility during the opening weekend of the general deer and general elk seasons, during holiday weekends, nor on the Friday preceding these weekends.~~

~~7. Road will not be used when wet and susceptible to damage. The driver and/or Energy West personnel will determine if weather/road conditions indicate damage to the road is possible.~~

~~8. Traffic will maintain speeds commensurate with existing conditions.~~

~~9. Road will be watered if dust becomes a problem or if excessive loss of road material occurs.~~

~~10. Usage of the Rilda Canyon Road will be limited to the period from April 15 through December 1 or as directed by the Utah Division of Wildlife Resources to protect the winter range and raptors.~~

~~11. Only one truck will be accepted at the Rilda facility for material delivery at any one time.~~

~~12. No petroleum products or fluids will be transported over the Rilda Canyon road to the Rilda Canyon surface facility.~~

~~13. Materials such as coal, coal mine development waste and/or non-coal waste will not be hauled of the Rilda Canyon portal and transported down the Rilda Canyon road without prior written approval from the USFS Manti-LaSal National forest, Utah DWR, and The Utah Division of Oil, Gas and Mining.~~

~~14. Any damage to the road or facilities that can be attributed to the material haulage test will be repaired.~~

~~15. Additional sediment control will be provided along the road above the gate as discussed with regulatory agencies. This will consist of installing additional riprap at the culvert discharge furthest from the gate.~~

~~16. Neither the road nor breakout pad will be widened.~~

~~17. PacifiCorp does not intend to upgrade the Rilda Canyon facilities in the future.~~

~~18. Prior to test approval, encroachment permits will be obtained from the Emery County Road Department and the Utah Division of Transportation.~~

~~19. PacifiCorp will obtain approval from North Emery Water Users Association prior to delivery of materials to the Rilda Canyon portal facility.~~

~~20. Permission be granted to transport the longwall system from Deer Creek Mine - Rilda portals via the Rilda Canyon road to the warehouse facility. Transferring of the longwall system is scheduled to start on June 1, 2002 and be completed by October 3, 2002.~~

- ~~Allowance to transport up to 10 loads per day of any combination of loads = longwall system or other bulk materials~~
- ~~Haulage of longwall equipment will only be allowed during daylight hours Monday through Friday. No hauling will be allowed on holiday weekends, including the prior Friday (entire day) as discussed in Stipulation #6. Holidays include all Federal, State holidays, including Pioneer Day.~~
- ~~This authorization will terminate as indicated, and then revert to the original agreement to allow 6 trips per day, limited to bulk materials as discussed previously.~~
- ~~All other provisions stated above would still apply~~

~~Specific locations and other information regarding the access road and facility pad in Rilda Canyon are shown in Vol. 4, Maps 2-15A and 2-17A; Vol. 5, Maps 3-9A and 3-9B; and Vol. 6, Maps 4-1A and 4-4A (Sheets 1, 2 and 3). More specific information about each of the structures and facilities is provided in the MRP. [Volume 2, Part 3 entitled "MINE FACILITIES (Rilda Canyon)"].~~

~~At this time Energy West Mining Company does not anticipate any further development at the Rilda Canyon facilities. There are not any plans to upgrade this facility for coal haulage or other foreseeable uses due to coal mining activities in the North Rilda area.~~

~~All facility plans are on file at PacifiCorp-Interwest Mining Company, One Utah Center, 201 South Main, Suite 2100, Salt Lake City, Utah 84140-0021. They are available for public inspection.~~

~~With the exception of roads and conveyors, a narrative explaining the construction, use, maintenance, and removal of the forenamed facilities can be found in Vol. 2, Part 3 of the MRP.~~

R645-301-526.116 Mining Within 100 Feet of Public Road

PacifiCorp proposes to relocate Emery County road #306 around the south side of the mine facilities which will necessitate culverting the Rilda Canyon stream for approximately 1200 feet. Hydrologic design and calculations for the undisturbed by-pass culvert is found in R645-301-700 Appendix B. Relocation of this road will be discussed in more detail as information becomes available.

R645-301-526.200 Utility Installation and Support Facilities

North Emery Water Users Association (NEWUA) possesses a spring collection system in Rilda Canyon near the proposed mine facilities location (refer to Map 5-1). This system consists of four (4) meters, one (1) collections box, and transfer lines. Two (2) meters and the collection box are located within the proposed disturbed area will have to be relocated. PacifiCorp commits to relocating these facilities to insure that no water delivery interruptions occur. The facilities will be moved to an area where they are not impacted by the county road or the mine facilities. More detailed information is forthcoming.

R645-301-527 TRANSPORTATION FACILITIES

~~The Deer Creek Mine operation utilizes roads and conveyors, in association facilities described in the Operation Plan (Vol. 2, Part 3). All portal facilities are shown in Vol. 5, Maps 3-9 and 3-9A. The Left Fork Rilda Canyon facilities are described in Volume 2, Part 3. A description of the construction, maintenance, and removal of each transportation facility at Deer Creek Portal follows.~~

Roads

The Deer Creek Mine Rilda Canyon operations utilize~~s~~ ~~four~~ three ~~facility~~ roads as follows:

~~a. Mine Access Road~~
~~b. Coal Facilities Access Road~~
~~c~~ a. North Rilda Canyon Portal Facility

1. Mine Service Road
2. Fan Access Road
3. Powder Magazine Service Road

~~d~~ b. Left Fork Rilda Canyon Access Road

~~The Deer Creek mine access road is asphalt surfaced. It extends approximately three miles from State Highway 31 in Huntington Canyon. A general road plan is shown in Vol. 6, Maps 3-18 and 3-19 and in the Deer Creek Coal Mining Permit Amendment, Rilda Canyon Surface Facilities, Vol. 5, Map 3-9A.~~

~~Road width averages 20 feet. Road gradient averages approximately 8% until it nears the facilities area. A 1,000 foot length of road from the truck loadout to the parking lot has a gradient of 18%. Steep narrow canyon terrain allows no leeway for a more gradual gradient. Sufficient evidence was provided to OSM and DOGM to make a determination whether a variance should be granted. Correspondence regarding a determination seemed to concur with PacifiCorp's (formerly UP&L's) findings that "major construction of complying roadways would increase environmental degradation".~~

~~Asphalt and road base thicknesses are variable due to periodic resurfacing. Asphalt thicknesses are at least 4 inches. The mine access road is crowned in the center, gradually sloping to the sides.~~

~~Runoff from the access road outside the portal area is collected in open ditches which drain into Deer Creek. Within the disturbed area, runoff is collected in open ditches, slot drains, and catch basins and routed through the sediment pond. Diversions are discussed in the Operation Plan (Vol. 2, Part 3). Road drainages outside the portal area beyond the mine gate are maintained by Emery County Road Department.~~

~~The access road was constructed and is maintained by the County and will remain in place between the mine gate and State Highway 31 to provide access to USDA Forest Service and fee lands.~~

~~The coal facilities access road is a 1,000 feet long winding gravel road up Elk Canyon which provides access to major components of the coal handling circuit. It has variable width and grade. It is utilized daily at low speeds by coal handling facilities labor and service personnel. Road construction was limited mainly to shallow blade work in the existing canyon soils.~~

~~Runoff from this road is collected in open ditches, sediment traps and inlets and carried to the sediment pond.~~

North Rilda Canyon Portal Facility

1. Mine Service Road: The service road starts at the upper (eastern) end of the property with a 6000 ft2. turn-out area where traffic enters from the county road.. The service road is approximately 1100 ft. long and terminates at the lower storage area. The service road is 22-feet wide for two-way traffic, with a nominal grade of 6%. Construction consists of a 6-inch thick enzyme treated base course on a prepared subgrade, topped with a 6-inch thickness of asphalt. Turn-outs are provided from the service road to the bathhouse/office complex, the parking lot area and the lower storage yard. Also there will be access to this service road from the county road at the upper storage yard, the parking lot and the lower storage yard. These accesses will have a gate with the capability of being locked to prevent entrance.

2. Fan Access Road: The fan access is a gravel road located behind the main portal pad and extends to the mine ventilation fan. Road gradient averages approximately 13%. Travel on this road is limited to once a day at low speed. Road width averages 12 feet. Drainage from the mine fan access road is collected in an open ditch in the "disturbed" drainage system.

3. Powder Magazine Access Road
The powder magazine access road is a gravel road located on the eastern end of the mine site below the Rominger Mine. The road gradient averages approximately 17%. Travel is limited to an "as needed" basis at low speeds. The road width is 12 feet. Drainage from this road is collected in an opened ditch in the "disturbed" drainage system.

Left Fork Rilda Canyon Access Road
The Left Fork Rilda Canyon Facility Access Road is approximately 1150 feet in length. It follows the north side of the Left Fork of Rilda Canyon from the end of the county road to the facility pad. The existing road/trail was upgraded to a gravel surfaced road with an average width of 11 feet and an average grade of approximately 8%. The road was designed in accordance with recommendations from the surface management agency (Manit-LaSal National Forest). See Volume 2, Part 3 for additional information.

~~Maintenance of all facility roads includes snow and debris removal, grading and resurfacing as needed.~~

~~Removal of all facility roads is discussed in Reclamation Plan of the Deer Creek MRP.~~
Vehicular access to the road is controlled by a locked barrier gate near the public turn-around area. However, the road continues to serve as a Forest Development Trail, allowing access by horseback and foot travel up the Left Fork of Rilda Canyon and beyond the facility area. Access to the facility fan pad is controlled with fencing and a locked gate at the point where the road enters the pad. The existing trail continues beyond this point.

Vehicular use of the road within the Left Fork Rilda Canyon facilities will only occur in emergency situations, for environmental maintenance, and delivery of solid, bulk materials. Environmental maintenance will include transportation of men, materials, and equipment required to maintain, install, or remove structures that are necessary to comply with environmental laws and regulations. Vehicular use of the road within the Left Fork of Rilda Canyon was revised through proper permitting action via USFS, UDWR, and UDOGM approvals to allow the permittee to transport a maximum of 5.4 truckloads (tractor/trailer combinations utilizing forty foot trailers or ten wheel end dump trucks) per day of solid, bulk materials for usage in the North Rilda area of the Mine. Access for routine equipment inspection and maintenance will be from underground. Surface environmental compliance inspections will be conducted on foot from the turn-around area. Snow removal will only occur in emergency situations and for delivery of solid, bulk materials. Should snow removal be necessary prior to December 1 or post April 15, snow removal will be accomplished by push, pickup, load and haul techniques. Snow volumes will be hauled to the Deer Creek Mine active waste rock site via ten wheel dump trucks and placed for proper treatment of the snow melt runoff. Side casting of snow into the Rilda Creek drainage or the adjacent road ditch will not be practiced.

The following typical materials could be shipped differently through the week to the Left Fork Rilda Surface Facility:

Material/Activity	Vehicle Used	Loads/day*	Loads/Week*
Longwall Support CANS/Cribs	Tractor/Trailer	2	10
Gravel Products	End Dump	3	15
Omega Block (Palletized)	Tractor Trailer Flat Bed	.4	2
Environmental Maintenance	Misc.		<1
Total		5.4	28

* Maximum number of loads per/day or loads/week unless specific permission is requested and approved to transport additional material.

The following Stipulations will be observed during delivery of material and environmental maintenance:

STIPULATIONS SPECIFIC TO THE LEFT FORK OF RILDA CANYON:

1. Delivery of material Monday through Friday only.
2. Delivery of material during daylight hours only.
3. Immediate off loading of materials.
4. Storage of materials on surface limited to gravel products and "can" crib products in approved locations. Specific storage areas will be identified during the testing period. Proposed storage areas will be identified on the surface facility map.
5. Access gate to road to be closed and locked leaving the Left Fork Rilda Surface Facility Access Road.
6. Material not to be delivered to Left Fork Rilda Portal facility during the opening weekend of the general deer and general elk seasons, during holiday weekends, nor on the Friday preceding these weekends.
7. Road will not be used when wet and susceptible to damage. The driver and/or Energy West personnel will determine if weather/road conditions indicate damage to the road is possible.
8. Traffic will maintain speeds commensurate with existing conditions.
9. Road will be watered if dust becomes a problem or if excessive loss of road material occurs.

10. Usage of the Left Fork Rilda Canyon Road will be limited to the period from April 15 through December 1 or as directed by the Utah Division of Wildlife Resources to protect the winter range and raptors.
11. Only one truck will be accepted at the Left Fork Rilda facility for material delivery at any one time.
12. No petroleum products or fluids will be transported over the Rilda Canyon road to the Left Fork Rilda Canyon surface facility.
13. Materials such as coal, coal mine development waste and/or non-coal waste will not be hauled ~~of~~ from the two Left Fork Rilda Canyon portal facilities and transported down the Rilda Canyon road without prior written approval from the USFS Manti-LaSal National forest, Utah DWR, and The Utah Division of Oil, Gas and Mining.
14. Any damage to the road or facilities that can be attributed to the material haulage test will be repaired.
15. Additional sediment control will be provided along the road above the gate as discussed with regulatory agencies. This will consist of installing additional riprap at the culvert discharge furthest from the gate.
16. Neither the road nor breakout pad will be widened.
17. PacifiCorp does not intend to upgrade the Left Fork Rilda Canyon facilities in the future.
18. Prior to test approval, encroachment permits will be obtained from the Emery County Road Department and the Utah Division of Transportation.
19. PacifiCorp will obtain approval from North Emery Water Users Association prior to delivery of materials to the Left Fork Rilda Canyon portal facility.
20. ~~Permission be granted to transport the longwall system from Deer Creek Mine - Left Fork Rilda portals via the Rilda Canyon road to the warehouse facility. Transferring of the longwall system is scheduled to start on June 1, 2002 and be completed by October 3, 2002.~~
    - ~~Allowance to transport up to 10 loads per day of any combination of loads – longwall system or other bulk materials~~
    - ~~Haulage of longwall equipment will only be allowed during daylight hours Monday through Friday. No hauling will be allowed on holiday weekends, including the prior Friday (entire day) as discussed in Stipulation #6. Holidays include all Federal, State holidays, including Pioneer Day.~~
    - ~~This authorization will terminate as indicated, and then revert to the original agreement to allow 6 trips per day, limited to bulk materials as discussed previously.~~
    - ~~All other provisions stated above would still apply~~

Specific locations and other information regarding the access road and facility pad in the Left Fork Rilda Canyon are shown in Volume 4, Maps 2-15A and 2-17A; Volume. 5, Maps 3-9A and 3-9B; and Volume 6, Maps 4-1A and 4-4A (Sheets 1, 2 and 3). More specific information about each of the structures and facilities is provided in the MRP. [Volume 2, Part 3 entitled "MINE FACILITIES (Rilda Canyon)"].

~~Conveyors~~

~~Eight facility conveyors are utilized at Deer Creek Mine. They are identified as follows:~~

~~a. Run-of-Mine Conveyor~~
~~b. Surge Bin Reclaim Conveyor~~
~~c. Fines Conveyor~~
~~d. Breaker Feed Conveyor~~
~~e. Breaker Reclaim Conveyor~~
~~f. Reject Conveyor~~
~~g. Crusher Feed Conveyor~~
~~h. Overland Conveyor~~

~~Two alternate conveyors are available for use if needed. They are the weigh bin conveyor and the truck loadout conveyor.~~

~~All facility conveyors are 42 inches wide and are covered to prevent wind erosion with the exception of the truck loadout conveyor which is seldom used. All conveyors are steel frame idler supported conveyors except for the overland conveyor and run-of-mine conveyors which are steel frame cable supported conveyors.~~

~~The 1,350 feet run-of-mine conveyor delivers 9 inches x 0 inches size coal to the coal surge bin from the mine. This conveyor will deliver as much as 2,500 tph.~~

~~The surge bin reclaim conveyor is approximately 150 feet long and delivers a maximum 1,500 tph to the primary screen for passage to either the breaker feed belt or the fines belt.~~

~~The 60 feet long breaker feed belt delivers a maximum 1,500 tph to the breaker station. The 80 feet fines belt delivers a maximum 1,000 tph to the overland conveyor. The 100 feet long breaker reclaim belt delivers a maximum 1,500 tph -6 inches to the crusher feed belt. Breaker reject delivers coal to the reject conveyor for delivery to the reject pile.~~

~~The crusher feed conveyor is approximately 70 feet long and delivers up to 1,500 tph to the crusher station.~~

~~Final -1 5/8" coal product from the crusher station is generally delivered to the overland conveyor which carries it directly to the Huntington Power Plant. The 1.8 mile long overland conveyor can deliver up to 1,200 tph. It is constructed in two long sections, one 3,000 feet and the other 6,400 feet.~~

~~If weighing of the plant product is desired, coal may be delivered to a 200 ton capacity coal weigh bin via the weigh bin conveyor.~~

~~Standard mechanical maintenance procedures are followed to ensure smooth operation and long life of the facility conveyors.~~

~~During reclamation, the conveyors will be dismantled and sold for salvage. Concrete foundations will be broken out and used for coarse backfill.~~

R645-301-528 HANDLING AND DISPOSAL OF COAL, OVERBURDEN, EXCESS SPOIL, AND COAL MINE WASTE.

There will be very limited amounts of coal mine waste transported through the Rilda Canyon portals. Most coal mine wastes will be removed through the Deer Creek portals. The Deer Creek MRP includes a narrative explaining the construction, modification, use, maintenance, and removal of coal, overburden, excess spoil, and coal mine waste through the Deer Creek portals. Coal mine wastes will be temporarily stored within the disturbed area of the North Rilda Canyon portal facilities before being transported to the Deer Creek waste rock site. Refer to the surface facilities Map 5-3 for temporary storage location.

Excess spoil material will be generated during the construction of the 2100 foot slope to access the Hiawatha coal seam above the mine facilities pad. Excess spoil will be utilized as a fill material for the construction of the mine facilities pads. The spoil will be placed in a controlled manner to ensure mass stability and prevent mass movement during and after construction. Excess spoil will meet the design criteria of R645-301-535. See this section for detailed design.

R645-301-528.330 Non-coal waste.
All non-coal wastes generated during mining activities and removed from the mine through the Rilda Canyon portals will be placed and stored in a controlled manner in a designated portion of the disturbed area as shown on Map 5-3. The material will be removed from the site and disposed of in an approved disposal facility.

R645-301-529 MANAGEMENT OF MINE OPENINGS

~~No portals or surface facilities area planned for the North Rilda Area. The Deer Creek mine permit includes a description of the measures to be used to seal or manage mine openings within the general permit area.~~
Two (2) portals are located in the Left Fork of Rilda Canyon which support intake and return, or ventilation entries for the operation of the mine. Two (2) additional portal openings are planned in the North Rilda area to access coal reserves associated with the Deer Creek Mine; one fan portal and one access portal.

The fan portal will be constructed from the underground to the surface with continuous mining operations. The portal will be stabilized and protected by constructing a concrete portal liner and headwall supports. The fan ducting will connect directly to portal liner to support the fan facilities.

Access to the mine will be accomplished by constructing a portal and rock slope from the surface. This portal and slope will be constructed at the elevation of the mine facilities pad and sloped upward at 8% for approximately 2100 feet to the Hiawatha coal seam. The dimensions of the portal will be a 20' x 9' foot rectangular opening. Mine equipment and men will use this portal to access the northern part of the Deer Creek Mine.

Methods used to construct this portal and tunneled slope will utilize conventional drill and shoot methods. It is estimated that approximately 14,000 BCY will be available as a useable fill material for the facility pad construction. This material will be brought to the surface using underground mining equipment (refer to R645-301-600 Geology for acid-or-toxic forming analysis).

Sealing of the portals in the Left Fork Rilda Canyon is detailed in Volume 2, Part 4, Reclamation Plan. Sealing of the portals in the North Rilda Canyon portal facility is detailed in the reclamation plan in Section R645-301-540.

R645-301-530 OPERATIONAL DESIGN CRITERIA AND PLANS

~~The Deer Creek MRP includes a general plan for each sediment pond, water impoundment, and coal processing waste bank, dam or embankment within the permit area (see Vol. 2, Part 3). No additional sediment ponds, impoundments, coal processing waste piles, dams or embankments are planned for the North Rilda Area.~~

The North Rilda Canyon portal facilities covers approximately 10.25 acres of disturbed area. All water within this area will be conveyed to drop drains and culvert systems into the sediment pond. Storm water runoff will be treated by a sedimentation pond sized for this area (approximately 150x50x15 feet). Refer to R645-301-700 Appendix B for design calculations and structural design.

The sediment pond has been designed to contain the volume of a 10yr/24hr event without discharge. The sediment containment is designed for 0.1 ac.ft./ac. or 1.15 ac.ft. The pond will be cleaned of sediment when the sediment volume reaches 60% of the total containment volume capacity.

If there is a need to discharge storm water runoff from the sedimentation pond, it will be discharged into the Rilda Canyon Creek. The Deer Creek UPDES permit will be amended to include this discharge point (UT0023604-003).

This are no underground operations below this pond that could potentially impact the structure.

R645-301-532 SEDIMENT CONTROL

~~No surface facilities, sediment control, or other disturbance is planned for the North Rilda Area. The MRP describes designs for sediment control for the Deer Creek facilities.~~

There are five (5) facility pads and one (1) portal pad withing the disturbed area of the North Rilda Canyon portal facilities. Water runoff will be collected in drop drains on each pad and transferred to the sediment pond through a buried culvert system. The water collection system design is found in R645-301-700 Appendix B.

Sediment control on cut slopes will be accomplished primarily by revegetation. Prior to the establishment of vegetation, the cut slopes will be protected by the application of a surface tackifer, rock mulch, erosion control fabric, and/or other means approved by the Division. An undisturbed drainage will be constructed at the toe of the cut slopes to divert all undisturbed drainage away from the disturbed area. Diversion ditches will be protected using protective barrier to physically separate the disturbed from the undisturbed areas.

Other sediment control measures are discussed in detail in the Hydrology Section.

R645-301-533 IMPOUNDMENTS

~~No impoundments are planned for the North Rilda Area.~~

As described previously, a sediment pond will be utilized to collect storm water runoff from the undisturbed area of the surface facility area. The design of the pond is found in R645-301-700 Appendix B. Pond design encompasses 10.2 acres of disturbed land.

R645-301-534 ROADS

~~No new roads are planned for the North Rilda Area. For a discussion on the access road for the Deer Creek Mine, refer to Vol. 2, Part 3 of the MRP.~~

Left Fork Rilda Canyon

The Left Fork Rilda Canyon Fan Access Road is approximately 1,150 feet in length. It follows the north side of the Left Fork of Rilda Canyon from the end of the county road to the facility pad. The existing road/trail was upgraded to a gravel surfaced road with an average travel width of 11 feet an average grade of approximately 8%. The road was designed in accordance with recommendations from the surface management agency (Manti-LaSal National Forest).

Drainage control is provide by a ditch along the north side of the road. The ditch is armored with type L, D50 = 9" riprap at stations 3=36 to 6+55, 7+69 to 9+89 and 11+82 to 13+96 to comply with DOGM and Forest Service Stipulations (refer to Map 3-9B in Volume 5). Additionally, Map 3-9B, certified 8/31/95, illustrates the typical rip rapped ditch installation. Flows in the ditch are controlled by rip rap. An 18" diameter CMP culverts carries the flow beneath the road and into the natural drainage system. Further information regarding drainage controls along the access road is found in Volume 3: Appendix VII, Surface Runoff Control Plan, prepared by Hansen, Allen & Luce.

The road and culverts will be removed during final reclamation of the site and the Forest Development Trail will be re-established. Refer to the Reclamation Plan for the Left Fork Rilda Canyon fan facilities in Volume 2, Part 4.

North Rilda Canyon Portal Facilities
There are no new roads proposed for the North Rilda Canyon Portal facilities area. The existing county road will need to realigned around the main facility area and out of the disturbed area. The design of the realigned portion will be incorporated into Volume 11 as the information becomes available.

R645-301-535 SPOIL

~~For a discussion on spoil of the Deer Creek Mine, refer to Vol. 2, Part 3 of the MRP.~~

In the development of the portal and slope facilities for accessing the Mill Fork reserves from Rilda Canyon, approximately 14,000 bank cubic yards of Star Point Sandstone spoil will be utilized as fill for the facilities pad area. A description of this material is found in the R645-301-600 Geology Section. Chemical analysis is also found in this section.

Design of the excess spoil fill structure will be designed using current, prudent engineering practices and will meet any design criteria established by the Division. Design criteria will be added to this permit application as the information becomes available.

R645-301-536 COAL MINE WASTE

Underground development waste, coal processing waste, and excess spoil will continue to be disposed of in accordance with plans approved by DOGM and MSHA. There are no plans to return coal processing wastes to the underground workings at the Deer Creek Mine. All coal mine wastes will be removed from the mine through either the Deer Creek portals or the Rilda Canyon portals and disposed of at the Deer Creek wasted rock site in Huntington Canyon.

A temporary coal mine waste storage facility is located on the surface at the Rilda Canyon portal facility in Rilda Canyon. Coal mine waste will be temporarily stored in this facility before being permanently stored at the Deer Creek waste rock site. Refer to Map 5-3 for storage facility location.

~~There are three waste rock disposal areas associated with the Deer Creek Mine. The first location (Area 1) in known as the Main Yard Extension, located north of the access road between the parking lot and the truck loadout. Area 1 was utilized for placement of waste rock until 1988 when it reached its capacity.~~

~~The second location (Area 2) known as the Elk Canyon Storage Pad, is located on the western slope at the mouth of Elk Canyon. Area 2 was utilized for placement of waste rock when Area 1 reached its capacity and while Area 3 was being permitted. Area 2 is no longer used for waste rock disposal.~~

~~The third location (Area 3) is located east of the Huntington Power Plant within Section 6 T17S, R8E, SLM. Area 3 was approved by DOGM September 13, 1988 and currently serves the waste rock disposal requirements of the Deer Creek Mine. All permitting criteria for Area 3 are discussed in Appendix XII, Volume 10. Areas 1 and 2 are discussed in Vol. 2, Part 3 of the MRP. The discussion includes disposal locations, chemical analyses of the wastes, estimated waste volume calculations, designs, construction and operation, maintenance, slope stability analysis, surface runoff, hydrologic analysis, ditch designs, and final reclamation.~~

~~The quantity of material to be disposed of is estimated using the past history of waste rock generated by the mining operations. The allowable quantity generated per year is 50,000 tons.~~

~~Potential sources of waste rock at Deer Creek Mine are (1) underground rock slopes and raise/shaft development, (2) entry rehabilitation, and (3) trommel screen reject from the breaker station.~~

R645-301-540 RECLAMATION PLAN

~~No surface disturbance is planned for the North Rilda Area. A reclamation plan for the Deer Creek Mine is described in Volume 2, Part 4 of the MRP. This plan includes narrative, maps, designs and plans for the mine.~~

~~Because no surface disturbance is planned for the North Rilda Area, a reclamation plan is not necessary for expansion into this area.~~

The reclamation plan for the Left Fork Rilda Canyon fan portal facility is found in Volume 2, Part 4. The reclamation plan for the North Rilda Portal Facilities will be incorporated as the information becomes available.

R645-301-500 ENGINEERING SECTION

FIGURES

- **FIGURE 500a: TYPICAL MAIN ENTRY AND PANEL DEVELOPMENT**
- **FIGURE 500b: TYPICAL LONGWALL PANEL RETREAT**

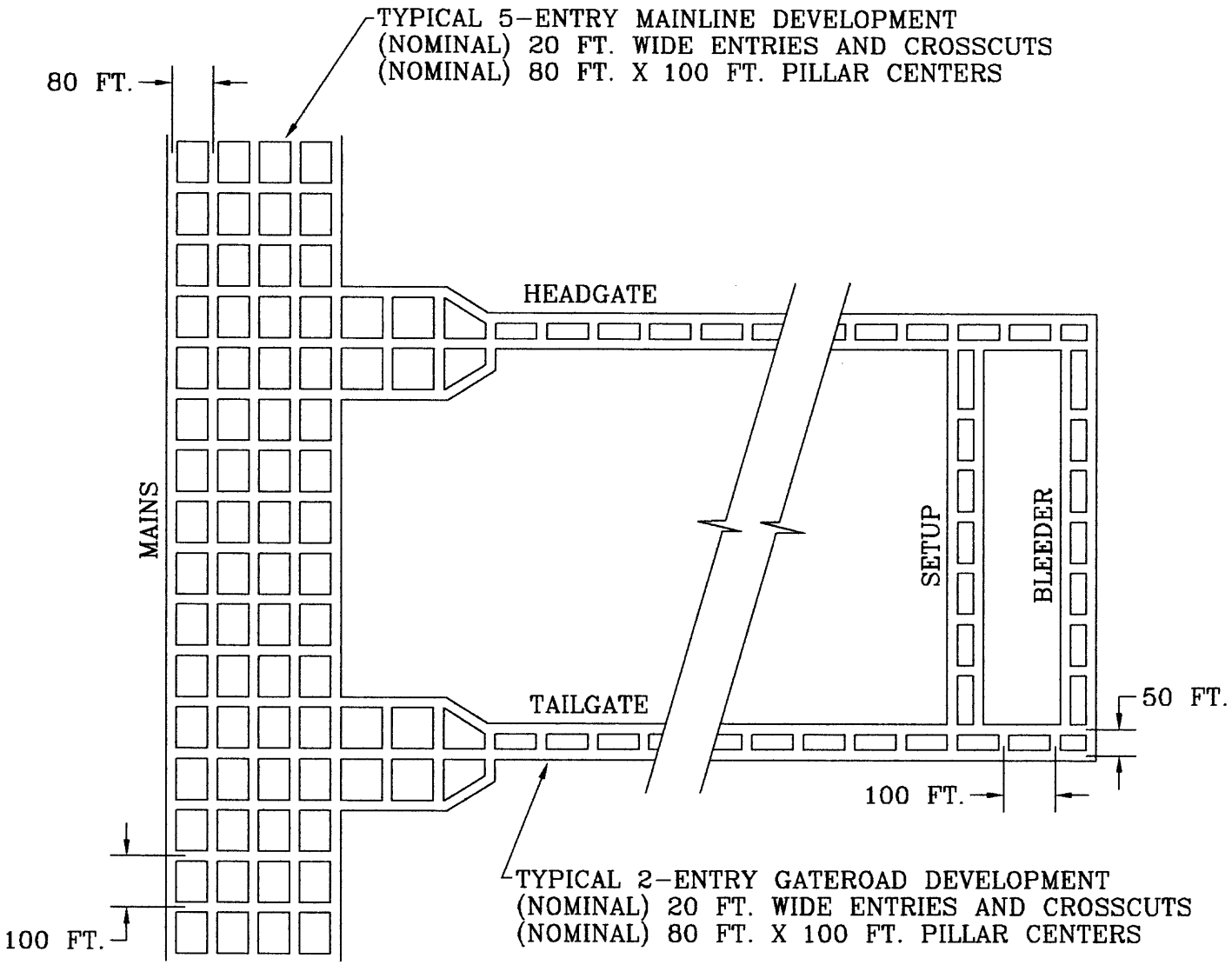


FIGURE R645-301-500a
TYPICAL MAIN ENTRY AND PANEL DEVELOPMENT
FOR THE NORTH RILDA AREA OF THE DEER CREEK MINE

CAD FILE NAME/DISK#: TYPMAIN

ENERGY WEST MINING COMPANY HUNTINGTON, UTAH 84528		
DEER CREEK MINE NORTH RILDA AREA TYPICAL MAIN ENTRY AND PANEL DEVELOPMENT		
DRAWN BY: K. LARSEN	FIGURE R645-301-500a	
SCALE: NONE	DRAWING #:	
DATE: JANUARY 10, 1997	SHEET 1 OF 1	REV.

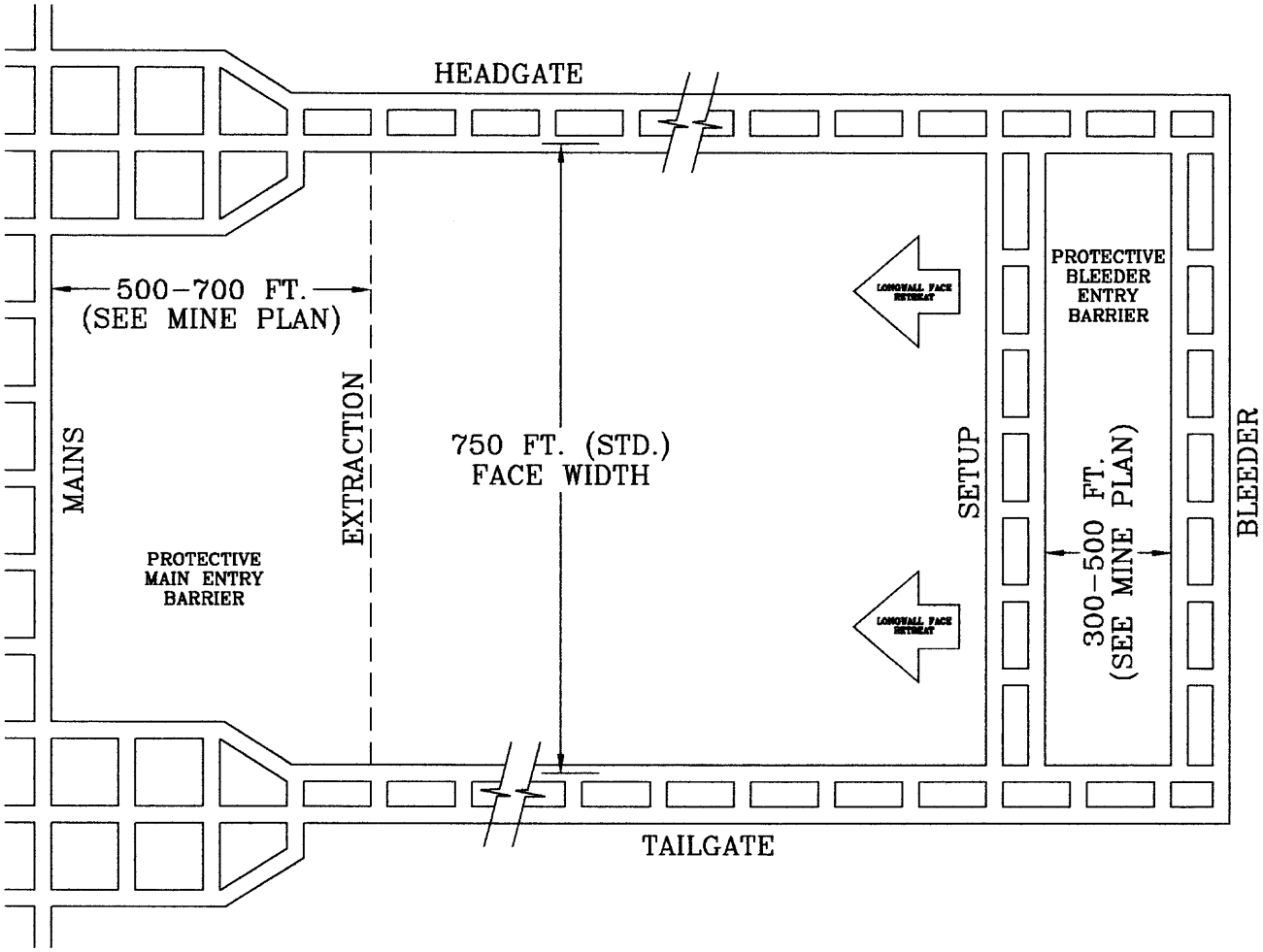


FIGURE R645-301-500b
TYPICAL LONGWALL PANEL RETREAT
FOR THE NORTH RILDA AREA OF THE DEER CREEK MINE

CAD FILE NAME/DISK#: TYPLW

ENERGY WEST MINING COMPANY HUNTINGTON, UTAH 84528	
DEER CREEK MINE NORTH RILDA AREA TYPICAL MAIN ENTRY AND PANEL DEVELOPMENT	
DRAWN BY: K. LARSEN	FIGURE R645-301-500b
SCALE: NONE	DRAWING #:
DATE: JANUARY 10, 1997	SHEET 1 OF 1 REV. ___

R645-301-500 ENGINEERING SECTION

APPENDIX A

♦GROUND STABILITY ANALYSIS: 4/5TH NORTH MAINS CROSSING OF THE RIGHT FORK OF RILDA CANYON

GROUND STABILITY ANALYSIS
4/5TH NORTH MAINS CROSSING OF THE RIGHT FORK OF RILDA CANYON

ENERGY WEST MINING COMPANY
NORTH RILDA AREA PERMIT APPLICATION
DEER CREEK MINE
(JULY 1997 - REVISED SEPTEMBER 1998)

RE: LONG TERM GROUND STABILITY ANALYSIS OF THE IMMEDIATE AREA OF THE PROPOSED INTERSECTION/UNDERGROUND CROSSING OF THE DEER CREEK MINE'S 4/5TH NORTH MAINS AND THE RIPARIAN ZONE WITHIN THE RIGHT FORK OF RILDA CANYON; FEDERAL LEASE U-06039.

INTRODUCTION:

A portion of the Right Fork of Rilda Canyon lies within the proposed North Rilda Area Permit Application of the Deer Creek Mine. Due to the environmental sensitivity of the Right Fork area (specifically the sub-surface hydrologic alluvial system and associated surface riparian vegetation zone), a complete analysis of a proposed "no subsidence / long term stability" design of the 4th/5th North Mains development within the area of the Right Fork of North Rilda Canyon has been prepared addressing the long term ground stability and subsidence protection of the area with regards to proposed mining. All pre-mining and post-mining conditions have been evaluated based on the best geologic and engineering information currently available (SEE ATTACHED ENCLOSURES - DEER CREEK MINE RIGHT FORK OF RILDA CANYON PROFILES AND CROSS SECTIONS; DRW.# DS1633D [HM-10] AND # DU1687E [HM-11]).

4/5TH NORTH MAINS (OVERVIEW):

The 4th North Mains, consist of a 5-entry development section, bearing northwest from the Deer Creek 10th West Mains. Initial location of the 10th West / 4th North intersection was based on the following:

(1) Existing Blind Canyon Seam conditions encountered with regard to 10th West Mains development
(2) Proximity to the projection of the Mill Fork Fault Graben
(3) Most practical access route to the North Rilda - Blind Canyon and Hiawatha coal reserves, across the North Rilda Forks area.

A complete analysis, with regard to location and long term ground stability of the 4th North/10th West Mains and the Left Fork of Rilda Canyon was conducted and submitted by PacifiCorp to the BLM on November 15, 1996. Approval to proceed with relocation and

INCORPORATED
EFFECTIVE:
FEB 22 1999
3/24/99
UTAH DIVISION OIL, GAS AND MINING

development of the 4th North Mains was given by the BLM (per letter) February 13, 1997.

With regard to PacifiCorp's North Rilda Area Permit Application, the 4th North Mains were originally projected to be developed northwest (approximately 3000 feet), from the 4th North / 10th West Mains intersection. The mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to maps HM-9, HM-10 and HM-11). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon. If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control groundwater if present.

Based on the information gained from the surface exploration drilling , a detailed plan was developed to reposition the 4th North / 5th North intersection. This plan optimized the "no subsidence/ long term stability" design for the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizes the overall reserve recovery within the area.

RIPARIAN ZONE - RIGHT FORK OF RILDA CANYON

The riparian zone within the Right Fork of Rilda Canyon (as shown on the above referenced enclosures) was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial fill with the canyon's side slopes. The alluvial/colluvial fill contacts were inferred from existing map contours where rapid changes in slope gradient were assumed to indicate a material composition change. The alluvial/colluvial fill contact was assumed to occur where these grade changes occurred.

The riparian zone (as mapped) also includes an agency requested "buffer zone". This "buffer zone" is calculated from the lower Hiawatha seam's horizon/elevation @ 15 degrees to a point of intersection on the surface. The "buffer zone" delineates an area restricted from full extraction second mining.

INCORPORATED
EFFECTIVE:
FEB 22 1999 24/99
98A
UTAH DIVISION OIL, GAS AND MINING

This referenced 15 degree "angle-of-draw" / "angle-of-influence" is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full-extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above. The angle of draw of subsidence produced by full-extraction mining can be influenced by many factors. These include the size of the area mined, number of seams mined, fractures or faults in the overburden, adjacent mine workings, and adjacent areas of burned coal and clinker. If mine workings extend to an area of burned coal, experience has shown that the overburden stresses above the mined area can be transferred to the adjacent burned coal and clinkers which can cause the clinkered areas to fail. In this case, the angle of draw may appear to be very shallow, when the crushing of the clinkered areas are the source of subsidence outside the normal area of influence.

Faults can also influence the angle of draw. If mining occurs adjacent to an existing fault, the area of subsidence will follow the natural plane of weakness formed by the fault. In this case, the angle of draw will be the same as the dip of the fault.

Based on data collected by the U.S. Bureau of Mines and eighteen years of subsidence data collection on East and Trail mountains, the angle of draw is found to be between 0 and 15 degrees from vertical. In some limited areas, the angle of draw is greater than 15 degrees, but in every case, the angle is greater due to the influence of one of the other factors mentioned above.

For planning purposes, any barrier of protection left in the mine to protect surface features should use a 15 degree angle of draw unless one of the factors mentioned above is known to exist in the immediate area.

All mining considered within the Forks area of Rilda Canyon is proposed as "partial extraction"/"zero-subsidence" reserve recovery. Therefore, the buffer zone (as shown) only delineates how close second mining may be projected within the Rilda Canyon Fork area of Federal Lease U-06039.

5TH NORTH MAINS - DEER CREEK MINE

The 5th North Mains consist of a 5-entry mainline development section with standard support pillars on 80 ft. x 130 ft. centers. Standard overall entry height ranges from 7.0 - 8.5 feet. Standard overall entry width ranges from 18.0 - 22.0 feet. As discussed above, the 5th North Mains assume a northeast bearing across the intersection/crossing area of the Right Fork of Rilda Canyon within Federal Lease U-06039.

The immediate roof strata overlying the Blind Canyon coal seam, in the general area of the Deer Creek Mine's 5th North Mains/Right Fork crossing of Rilda Canyon, ranges from approximately 170 to 210 feet in total thickness and consists of interbedded sandstones / mudstones; massive

INCORPORATED
EFFECTIVE:
FEB 22 1999 3/24/99
UTAH DIVISION OIL, GAS AND MINING

sandstones, and alluvial/colluvial fill. Surface exploration drill holes EM-160 - EM-162 provides the best representative lithologic unit for this site specific area (See Attached Enclosures maps HM-10 and HM-11 for detailed information).

The proposed configuration of the 5th North Mains, throughout the area of the Right Fork of Rilda Canyon, is similar to the current configuration of the existing 10th West / 4th North Mains (within the Left Fork area of Rilda Canyon). Both canyon crossings are considered designed and protected for "**ZERO-SUBSIDENCE**" to insure the required long term (hundreds of years) stability and integrity of the underground openings with regard to limiting the potential of any future surface impact.

To insure long term stability of the 5th North Mains and afford further protection to the riparian zone throughout the effected area of 5th North Mains crossing of the Right Fork area, entry/pillar configuration will consist of a 5-entry development with staggered cross-cuts on 80ft. x 150 ft. pillar centers (See Attachment #1). Primary roof support throughout the immediate area will consist of standard 5 ft. resin grouted roof bolts on 5 ft. centers. Secondary roof support (as ground/roof conditions dictate) will consist of a combination of available materials (ie: point-anchor [active/grouted] roof bolts, steel bearing plates, wire mesh, steel roof mats, grouted cable bolts, "CAN" cribs, wooden cribs, etc.).

STABILITY ANALYSIS

To address the concerns with regard to the long term stability of the mine openings proposed within the Right Fork area of Rilda Canyon, pillar stability and beam theory analysis is presented within this report.

PILLAR STABILITY:

The long term stability of the proposed 80 ft. x 150 ft. support pillars (proposed within the riparian zone of the Right Fork crossing) were evaluated using the Tributary Area Analysis Method (See Attachment #2).

This analysis is very conservative because it assumes that an in-mine pillar will support **ALL** of the immediate overburden directly above it. Actual in-mine studies have indicated that a support pillar will only see a portion (60% - 70%) of the actual vertical overburden weight. The overburden cross-section, along the original projected bearing of the proposed 4th North Mains , prior to the re-location 800 feet to the west, (Section A - A'; See Map HM-11), details the immediate area of the alluvial/riparian zone of the Right Fork of Rilda Canyon. Overburden thickness varies from 648 ft. at the northeast margin to 99 ft. in the bottom of the Right Fork Canyon.

Pillar stress and safety factors were calculated at different locations along the development bearing using the Tributary Area Analysis method. The pillar compressive strengths used in the analysis are actual measured (in-mine) strength values, averaging approximately 4000 psi.

INCORPORATED
EFFECTIVE:
FEB 22 1999
3/24/99
UTAH DIVISION OIL, GAS AND MINING

Once pillar strength and pillar stress is known, a factor of safety is calculated. The factor of safety is calculated by dividing the pillar strength by the pillar stress. A factor of safety of 1.0 or greater indicates stability. A factor of safety of 1.5 - 2.0 (or greater) indicates long term stability. The calculated factors of safety along the projected bearing of the 4/5th North Mains range from 3.57 under the deepest cover to 23.94 in the canyon bottom. These factors of safety indicate long term stability for the 4/5th North Mains layout throughout the area of the crossing of the Right Fork of Rilda Canyon.

BEAM ANALYSIS:

To further address the long term stability of the mine openings within the Right Fork area of Rilda Canyon, beam theory analysis was also employed (See Attachment #3).

Beam theory suggests, that when an underground opening is excavated, the immediate roof strata acts as a beam to support the strata overlying the opening. If the beam is strong enough to support itself and the effected overlying strata, then the opening will be stable.

When an underground opening is excavated, the stress distribution in the surrounding rock mass changes. The support that the excavated material supplied to the surrounding rock mass is no longer there. The stress therefore, arches over the opening and redistributes itself to the surrounding rock. In underground excavations, it is an accepted value that the zone of influence of an opening is determined to be approximately two (2) times the opening height. In beam theory, when an underground opening is excavated, the strata overlying the mine opening acts as a beam to support the immediate roof, or the material within the opening's affected zone.

Beam stability is evaluated by calculating the assumed beam's factor of safety. The factor of safety is the tensile strength of the beam divided by the maximum tensile stress that the beam is subjected to. It is assumed that a factor of safety of 1.5 - 2.0 (or greater) represents long term stability. Based on the proposed layout of the 4th North Mains within the area of the Right Fork of Rilda Canyon (prior to the relocation 800 feet to the west), this factor of safety is calculated at approximately 4.92 (See Attachment #3); indicating long term stability of the assumed roof beam and thus the mine entries.

SUPPLEMENTAL SUBSIDENCE MONITORING

Prior to development mining below the riparian zone of the right fork of Rilda Canyon, permanent subsidence monitoring sites were established directly above the proposed mains to verify ground stability conditions. Location of the stations were determined based upon the final mine layout for the proposed crossing. Monitoring will be conducted on a quarterly basis during accesible periods until lease relinquishment or until an alternate schedule is approved by D.O.G.M. and surface land management agency (U.S.D.A. Forest Service).

INCORPORATED
EFFECTIVE:
FEB 22 1999
3/24/99
UTAH DIVISION OIL, GAS AND MINING

FINAL RETREAT - NORTH RILDA ABANDONMENT

Prior to final mine retreat and abandonment of the North Rilda Canyon Area , PacifiCorp will submit (for technical review and evaluation to the appropriate permitting management agencies) historical in-mine and surface stability data necessary to assess the long-term surface stability of the Right Fork area of Rilda Canyon. An on-site review will be conducted to evaluate long-term stability of the Right Fork of Rilda Canyon.

Based on the site specific technical data review and evaluation mentioned above, final design and implementation of any additional ground support necessary to prevent long-term surface subsidence within the affected area will be based on the "best technology currently available" at the time of abandonment.

CONCLUSION

The Right Fork of Rilda Canyon contains an important alluvial system which contributes to the overall flow of springs and flow to Rilda Creek within the immediate area of Rilda Canyon (Federal Lease U-06039). Interburden between the canyon's bottom and the proposed 5th North Mains development horizon (Blind Canyon Seam), is shallow and represents a potential concern to the long term stability of these entries with regard to possible damage to the alluvial system due to entry failure and surface subsidence.

As per the above discussion, both pillar stability and beam failure analysis demonstrates factors-of-safety far in excess of those required for long term stability. The proposed entries of the 5th North Mains within the Forks area of Rilda Canyon represent PacifiCorp's long term access to the North Rilda Canyon reserves within the Blind Canyon and Hiawatha Seams and are considered critical to Deer Creek Mine's future. Any potential ground/entry instability in this area is not acceptable from either an environmental or mining standpoint.

From the study/analysis presented, it is evaluated that the proposed "no subsidence / long term stability" design of the 5th North Mains (within the area of the Right Fork of North Rilda Canyon) demonstrates full protection to the alluvial/hydrologic system and riparian zone present and that the integrity and long term stability of the Right Fork Canyon is not compromised by the proposed underground development mining necessary to access the existing North Rilda coal reserves.

INCORPORATED
EFFECTIVE:
FEB 22 1999
98A
UTAH DIVISION OIL, GAS AND MINING

CASTLEGATE ESCARPMENT
STATEMENT OF MINING IN THE NORTH RILDA AREA
AREA OF FEDERAL LEASE U-06039

ENERGY WEST MINING COMPANY
NORTH RILDA AREA PERMIT APPLICATION
DEER CREEK MINE
(JULY 1997 - REVISED SEPTEMBER 1998)

RE: CLARIFICATION STATEMENT REGARDING THE CASTLEGATE ESCARPMENT AND PROPOSED MINING IN THE NORTH RILDA CANYON AREA OF FEDERAL LEASE U-06039, U-024317, SL-051221, U-2810.

AGENCY REQUIREMENTS:

Except at specifically approved locations, the Castlegate escarpment must be protected from mining induced failure. Where escarpment failure is proposed or anticipated, an environmental analysis would be needed to assess the following:

a. How much escarpment could fail based on analytical methods, observation of similar areas, geologic/topographic conditions, and panel orientation.

b. What resources would be affected by escarpment failure and description of the nature and magnitude of these effects (ie: vegetation; wildlife and habitat; threatened/endangered and sensitive species; cultural and paleontological resources; hazards; visual quality; etc.).

CASTLEGATE ESCARPMENT - NORTH RILDA CANYON AREA:

The Castlegate Sandstone escarpment within the North Rilda Permit Application area has been defined in the permit application in two (2) distinct portions:

NORTH CASTLEGATE ESCARPMENT - NORTH RILDA CANYON AREA

The Castlegate Sandstone escarpment within the northern portion of the North Rilda Area (north face of the ridge) has very limited surface exposure due to the presence of talus slopes and forest vegetation which cover most of the escarpment in this area. Due to the limited surface exposure of the Castlegate escarpment (refer to Castlegate Sandstone Outcrop - South Side of Mill Fork Canyon), mine layout of the North Rilda area (i.e.; the four (4) northernmost longwall panels

INCORPORATED
EFFECTIVE
FEB 22 1999
98A
UTAH DIVISION OIL, GAS AND MINING

in the Blind Canyon and Hiawatha Seams - North Rilda Area) will be consistent with previous design methods employed on the south side of Rilda Canyon. Environmental monitoring will consist of 1) annual raptor surveys conducted in conjunction with the Division of Wildlife Resources, 2) subsidence assessments: [a) annual photogrammetric evaluations, b) annual aerial reviews], and 3) pre / post mining photographic analysis.

The northern Castlegate Sandstone escarpment in the North Rilda Canyon area is similar in geology, slope, vegetative cover and physical layout to many portions of the Castlegate escarpment already undermined on the south side of Rilda Canyon. The following section presents a comparison of the Castlegate escarpments of these two areas and the effects of full-extraction mining on the escarpment on the south side of Rilda Canyon, and anticipated mining impacts on the north Castlegate escarpment of the North Rilda Area.

Castlegate Sandstone Subsidence - Related Features on the South Side of Rilda Canyon and Predicted Subsidence Effects on Castlegate Outcrops on the South Side of Mill Fork Canyon:

South Side of Rilda Canyon

Portions of the Castlegate Sandstone outcrop or "escarpment" on the south side of Rilda Canyon have been undermined by Deer Creek Mine longwall mining from March 1995 to April 1997 (see Drawing # DU1688D, Castlegate Escarpment Comparison). Longwall mining under this escarpment is essentially complete. Approximately 16,500 linear feet of escarpment have been undermined in the Rilda Canyon area.

During routine subsidence monitoring overflights in May 1996, several subsidence - related features were noted on the Castlegate outcrop in areas mined from March 1995 to April 1996:

On the eastern portion of the outcrop undermined March 1995 to January 1996 in 5th, 6th, and 7th East longwall panels, several minor subsidence - related disturbances were noted (see two drawings titled Castlegate Sandstone Outcrop - South Side of Rilda Canyon). These included 7 separate rock rolls, some of which had toppled individual trees and 3 ground tension cracks just above the outcrop. None of these features would be visible to a casual observer in Rilda Canyon.

On the western portion of the outcrop, over the 8th West longwall panel, a larger subsidence - related feature, a rock fall, has separated from a prominent Castlegate point and slid down a forested slope to the canyon bottom, creating a visible rock fall feature. This fall occurred on a narrow protruding point with an approximately east-west face. Jointing of the Castlegate is approximately north - south in this area. The area affected is approximately 200 feet long by 50 to 100 feet high. The cliff face has split off in two distinct spots, the larger on the east and the smaller on the west. The two falls merge about 200 feet below the escarpment, and continue to the canyon bottom.

INCORPORATED
EFFECTIVE:
FEB 22 1999
98A
UTAH DIVISION OIL, GAS AND MINING

South Side of Mill Fork Canyon

On the south side of Mill Fork Canyon, the Castlegate Sandstone outcrops in the midst of a heavily forested north-facing slope, presenting outcrop features generally less steep and cliff-like than those outcrops of the eastern portion of the south side of Rilda canyon (see Castlegate Sandstone Outcrop comparison photographs for Rilda and Mill Fork canyons). Four prominent points and a few rocky slopes protrude from the dense forest cover. According to the current Energy West Deer Creek mine plan, approximately 8,000 linear feet of Castlegate Sandstone outcrop are projected to be undermined. Based on a geologic assessment including outcrop mapping and photographic analysis, the outcrop of the Castlegate Sandstone in terms of cliff exposure is limited to approximately 1,200 linear feet located in Section 21, T. 16 S., R. 7 E. Subsidence - related features along this outcrop are expected to be at most similar and probably less severe than those along the south side of Rilda Canyon which included minor rock rolls and one area of cliff failure noted earlier.

SOUTH CASTLEGATE ESCARPMENT - NORTH RILDA AREA

The Castlegate Sandstone escarpment within the southern portion of the North Rilda Area (south face of ridge) has a prominent surface exposure. Maleki Technologies, Inc. completed a geotechnical study evaluating the potential effects of longwall (full-extraction) mining on the stability of the Castlegate escarpment (i.e.; Cottonwood Newberry Canyon / Corncob Wash and Trail Mountain 5th East / Cottonwood Canyon Test Areas), and developed a predictive escarpment/mining model for the south Castlegate Escarpment - North Rilda Area. The model developed from these studies forecast effects of proposed mining under the escarpment within the southern portion of the North Rilda Area (ie: The two (2) southern most longwall panels proposed in the Blind Canyon and Hiawatha Seams - North Rilda Area).

. APPROVED R2P2 MAP NOTATION - NORTH RILDA AREA

As noted on the approved Resource Recovery and Protection Plan (R2P2) map, "ACTUAL LONGWALL CONFIGURATION OF THE NORTH RILDA CANYON RESERVES IS SUBJECT TO ON-GOING CASTLEGATE ESCARPMENT STUDIES AND ON ACTUAL RESERVE LOCATION WITH REGARDS TO POSSIBLE OUTCROP BURN AREAS".

INCORPORATED
EFFECTIVE:
FEB 22 1999
98A
3/24/99
UTAH DIVISION OIL, GAS AND MINING

OVERVIEW / SCOPE OF ON-GOING CASTLEGATE ESCARPMENT GEOTECHNICAL MODEL EVALUATION; PACIFICORP/ENERGY WEST & MALEKI TECHNOLOGIES:

Since 1985/1986, PacifiCorp has been actively involved in evaluating, predicting, modeling and documenting full-extraction mining effects to the Castlegate escarpment. With the Newberry Canyon and Corncob Wash studies, numerical models were developed from field observation to back analyze and predict escarpment failure. The 2-D numerical models developed from these initial test section studies (ie: USBM / Seegmiller / Pariseau) were, for the most part, inconclusive and incomplete.

In 1996/1997, PacifiCorp set up another test section at the Trail Mountain Mine in Cottonwood Canyon (ie: 5th East LW Test Section). In addition to this field test section, a geotechnical project was initiated with Maleki Technologies and is presently on going.

The scope of the Maleki Technologies (Castlegate Escarpment Geotechnical Evaluation) project was as follows:

- Back analyze existing data from the Newberry Canyon and Corncob Wash studies (ie: field survey data, geologic/ lithologic data used, mining orientation/sequence, 2-D model development [USBM, Seegmiller, University of Utah]), and summary of conclusions.

- Selection of a separate study area within the existing Newberry Canyon/Corncob Wash Test Section. Development of a separate/updated 2-D finite element model to evaluate this modeling for conclusive escarpment failure results as compared to the post mining field data.

- Development of a separate (simplified) "risk/failure" mathematical probability model (through the use of linear regression) based on an updated geotechnical/geologic parameter survey of the new study area used in the above referenced new 2-D finite element model. Evaluate this modeling for conclusive escarpment failure results as compared to the post mining field data.

- Select the "best fit" model from the above referenced trial models and simulate the full-extraction mining of the Trail Mountain 5th East longwall within the test section. Recalibrate model to fit the field results of the Trail Mountain/Cottonwood Canyon Test Area.

- Evaluate the existing Colorado Rockfall Simulation Program (CRSP) with regard to the modeling and prediction of rock- fall from escarpment failure down the existing outslopes below the Castlegate formation. Recalibrate program to "best fit" field data from the Newberry Canyon/Corncob Wash and Trail Mountain/Cottonwood Canyon study areas.

- Summarize and present project findings to the applicable Federal and State regulatory agencies (with regard to modeling the southern Castlegate escarpment in the North Rilda

INCORPORATED
FEB 22 1999
UTAH DIVISION OIL, GAS AND MINING
98A

Canyon Area) prior to pre-mining environmental analysis of potential impacts from full-extraction mining within the immediate area of the Castlegate escarpment in the North Rilda Canyon Area. Maleki Technologies presented the conclusion of the in-depth geotechnical study to DOGM, USFS and BLM on May 26, 1998.

SUMMARY AND CONCLUSION:

As per joint PacifiCorp and Federal/State Agency discussion, final approval of full-extraction (longwall) mining of either the northern or southern portion of the Castlegate escarpment (within the North Rilda Canyon Area) will be based on an objective environmental analysis of potential mining induced escarpment failure and subsequent resource effect.

For the northern portion of the Castlegate escarpment, within the North Rilda Canyon Area (Federal Lease U-024317), analysis may include only a site visit to the few limited areas that the Castlegate formation has surface exposure.

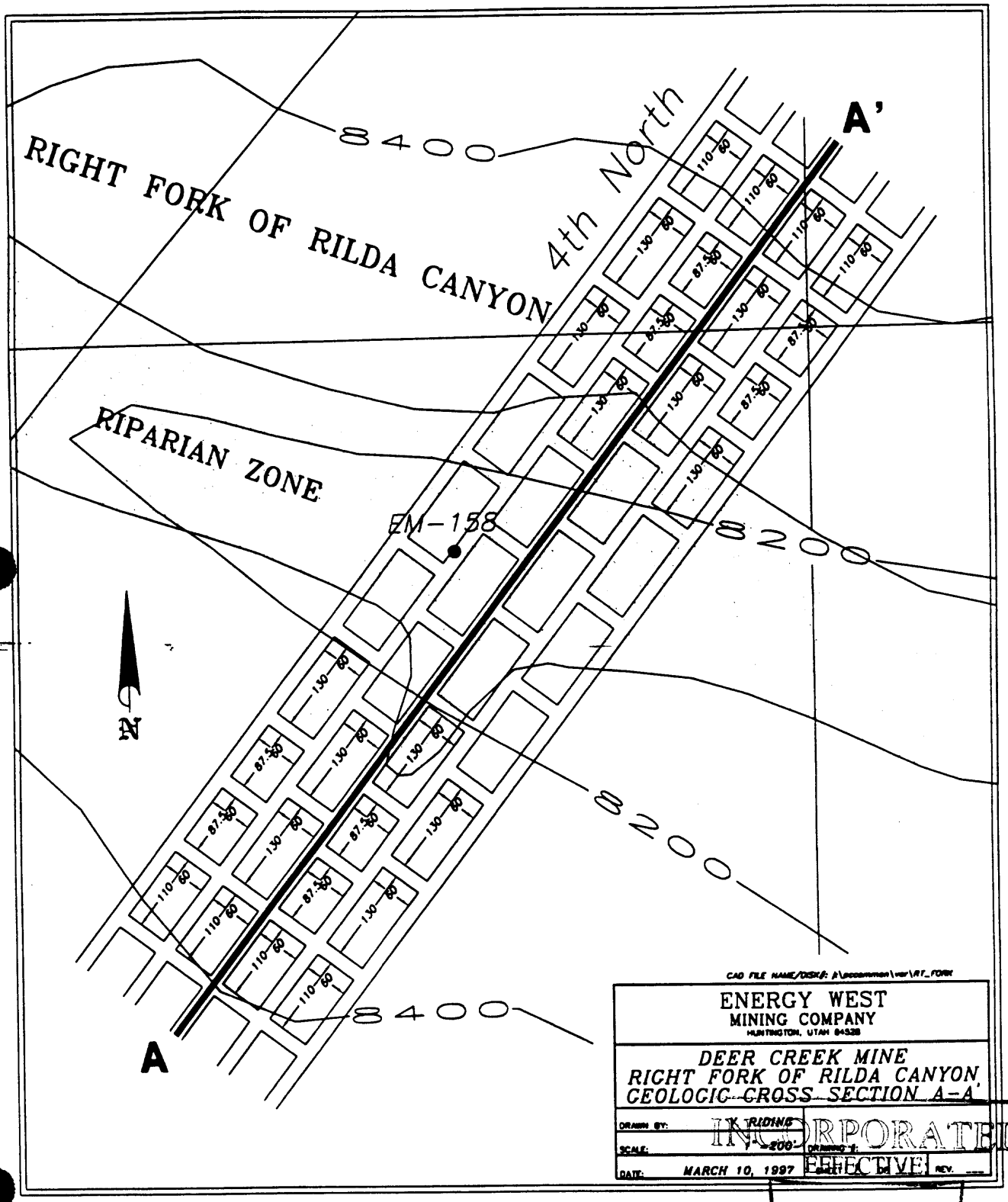
For the southern portion of the Castlegate escarpment, within the North Rilda Canyon Area (Federal Leases U-2810, SL-051221, U-06039), analysis may include escarpment failure and effect modeling as well as objective environmental analysis of the model prior to final (full-extraction) longwall mining approval.

INCORPORATED
EFFECTIVE:
FEB 22 1999
3/24/99
98A
UTAH DIVISION OIL, GAS AND MINING

ATTACHMENT #1

GENERAL LAYOUT OF THE 4TH NORTH MAINS CROSSING THE
RIGHT FORK AREA OF RILDA CANYON
DEER CREEK MINE

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING



INCORPORATED
EFFECTIVE

AUG 04 1997

97-1

UTAH DIVISION OIL, GAS AND MINING

ATTACHMENT #2

PILLAR STABILITY ANALYSIS
RIGHT FORK AREA OF RILDA CANYON
DEER CREEK MINE

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

EMPIRICAL PILLAR STABILITY ANALYSIS

Equations

Average Pillar Stress (Tributary Area Loading Concept)

$$Sp = \gamma \cdot H \cdot [(\frac{w+B}{w}) \cdot (\frac{L+B}{L}) \cdot \frac{1}{144}$$

where:	Sp	- average pillar stress (psi)
	γ	- overburden unit weight (lbs/ft^3)
	H	- overburden thickness (ft)
	B	- entry width (ft)
	w	- pillar width (ft)
	L	- pillar length (ft)

Pillar Strength (as determined by field measurements at Deer Creek Mine)

σ_P = 4,000 (psi, ave.)

Factor or Safety

$$FS = \frac{\sigma_P}{Sp}$$

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

EMPIRICAL PILLAR STABILITY ANALYSIS

Typical Calculation

Average Pillar Stress (Tributary Area Loading Concept)

$$Sp = \gamma \cdot H \cdot [(\frac{w+B}{w}) \cdot (\frac{L+B}{L}) \cdot \frac{1}{144}$$

where:	Sp	? - average pillar stress (psi)
	γ	158 (lbs/ft^3, as determined by measurements at Deer Creek Mine.)
	H	640 (ft)
	B	20 (ft)
	w	60 (ft)
	L	110 (ft)

$$Sp = 158 \cdot 640 \cdot [(\frac{60+20}{60}) \cdot (\frac{110+20}{110}) \cdot \frac{1}{144}$$

Sp = 1,106.5 (psi)

Pillar Strength (as determined by field measurements at Deer Creek Mine)

σ_P = 4,000 (psi, average)

Factor or Safety

$$FS = \frac{\sigma_P}{Sp}$$

$$FS = \frac{4000}{1106.5}$$

FS = 3.61

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

Average Pillar Factors of Safety along the Projected 4th North Mains

Location	Cross-Section	Overburden (H)	Pillar Dimensions (w)	Pillar Dimensions (L)	Pillar Strength σ_p	Pillar Stress *Sp* *	Factor of Safety FS
Right Fork of Rilda Canyon South Western Edge	Detail A - A'	635	60	110	4,000	1,098	3.64
Right Fork of Rilda Canyon South Western Edge Riparian Zone	Detail A - A'	150	60	130	4,000	253	15.80
Right Fork of Rilda Canyon Lowest Cover Along Cross-Section	Detail A - A'	99	60	130	4,000	167	23.94
Right Fork of Rilda Canyon North Eastern Edge Riparian Zone	Detail A - A'	188	60	130	4,000	317	12.60
Right Fork of Rilda Canyon South Western Edge	Detail A - A'	648	60	110	4,000	1,120	3.57

where:

Sp	?	(psi)
γ	158	(lbs/ft^3)
H	varies	(ft)
B	20	(ft)
w	60	(ft)
L	varies	(ft)

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

ATTACHMENT #3

ROOF BEAM ANALYSIS
RIGHT FORK AREA OF RILDA CANYON
DEER CREEK MINE

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-)
UTAH DIVISION OIL, GAS AND MINING

Beam Analysis

Overview:

Beam theory suggests, that when an underground opening is excavated, the immediate roof strata acts as a beam to support the strata overlying the opening. If the beam is strong enough to support itself and the effected overlying strata, then the opening will be stable.

Derivation:

Rock beam failure occurs when the peak stress in the beam exceeds the beam strength. The peak stress in the beam is determined by the flexure formula,

$$\sigma_{max} = M \cdot c/I$$

where,

M = maximum moment about the neutral axis
c = perpendicular distance from the neutral axis of the beam to its outermost fiber
I = the moment of inertia of the cross-sectional area of the beam computed about the neutral axis of the beam

Mine roof strata are rectangular in cross-section, and thus, the moment of inertia is given by:

$$I = b \cdot h^3/12$$

where,

b = the breadth of the section, assumed to be 1 foot in length, parallel to the long axis of the mine entry
h = height of the beam

The rock beam is loaded with a uniformly distributed load, thus the moment within the beam is given by:

$$M = w \cdot L^2/8$$

where,

w = uniformly distributed load along the beam
L = the length of the beam, and in this case, the width of the entry

The uniformly distributed load, is calculated by:

$$w = \gamma \cdot H \cdot b$$

where,

γ = the density of the overburden
H = the height of the effected zone

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

b = the breadth of the section, assumed to be 1 foot in length, parallel to the long axis of the mine entry

Equating the above relationships leads to the following equation for peak stress in the beam:

$$\sigma_{max} = (3/4) \cdot \gamma \cdot H \cdot (L/h)^2$$

where,

γ = the weight of the overburden
H = the height of the effected zone
L = the length of the beam
h = height of the beam

Discussion

The immediate roof strata overlying the Blind Canyon coal seam in the general area of the proposed Deer Creek Mine's 4th North Mains / Right Fork crossing of Rilda Canyon ranges from approximately 100 - 125 feet in total thickness and consists of interbedded sandstones / mudstones, massive sandstone, and alluvial fill (see Attachment #1).

To address the stability of the mine openings within the Right Fork of Rilda Canyon, beam theory will be employed. Beam theory suggests, that when an underground opening is excavated, the immediate roof strata acts as a beam to support the strata overlying the opening. If the beam is strong enough to support itself and the effected overlying strata, then the opening will be stable.

At the Deer Creek Mine, primary standard roof support consists of 5 feet resin roof bolts installed on 5 feet centers. This primary roof support locks the stratified layers of the immediate roof together, effectively forming a beam of support for the mine opening. The roof lithology immediately above the coal seam in the Right Fork of Rilda Canyon consists of 1.1 feet of sandstone followed by a 4.1 feet interbedded layer. The roof bolts lock these two lithologic units together forming a 5.2 feet rock beam in the roof.

When an underground opening is excavated, the stress distribution in the surrounding rock mass changes. The support that the excavated material supplied to the surrounding rock is no longer there. The stress therefore arches over the opening and redistributes itself to the surrounding rock.

In underground openings, it is accepted that the zone of influence of an opening is twice the height of the mine opening. In beam theory, when an underground opening is excavated, the strata overlaying the mine opening acts as a beam to support the immediate roof, or the material within the opening's effected zone.

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

Some rules of thumb in underground excavation are: the height of the effected strata is 2 times the height of the mine opening; and that mine openings that are more than 1 diameter apart do not interact to a significant degree. The proposed mine layout in the general area of the 4th North Mains / Right Fork crossing of Rilda Canyon consists of 5 entries with pillars on 150 x 80 feet centers with entry dimensions of 8 feet high and 20 feet wide. Taking the two rules of thumb into account, with a mine opening height of 8 feet, and mine openings that are more than 20 feet apart, the total height of the material to be supported is assumed to be 16 feet, including the beam (see Attachment #2).

Assumptions:

$\gamma = 151.3\ lb/ft^3$
$H = 16$ feet
$L = 20$ feet
$h = 5.2$ feet

Calculations:

$$\sigma_{max} = (3/4) \cdot (151.3) \cdot (16) \cdot (20/5.2)^2$$

$$\sigma_{max} = 186.51 \text{ psi}$$

Beam Stability:

Beam stability is evaluated by calculating its factor of safety. The factor of safety is the tensile strength of the beam divided by the maximum tensile stress that the beam is subjected to. The factor of safety is thus:

$$FS = \sigma_{pillar\ strength} / \sigma_{pillar\ stress}$$

where,

$\sigma_{pillar\ strength}$ = 918.25 psi, as determined from strength tests of East Mountain rock types
$\sigma_{pillar\ stress}$ = σ_{max}, as calculated above

$\therefore FS = 918.25/186.51$

$$FS = 4.92$$

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

A factor of safety of 1.5 to 2.0 indicates long term stability. The calculated factor of safety of 4.92 indicates long term stability of the beam, and thus the entries.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

Attachment #1

Coal Lithologic Log

Drill Hole: EM-158

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES
COAL LITHOLOGIC LOG

PROJECT: EAST MOUNTAIN
DRILL HOLE: EM-158
PAGE 1 of 3

LOCATION: RIGHT FK RILDA CANYON
COLLAR ELEV.: 8120.76
HOLE TYPE: CORE
PLUG INTERVAL: NONE
CORE INTERVAL: 0 - 226.5
TOTAL DEPTH: 226.5
DATE: 10/20/96
SCALE: 1" = 10'
GEOLOGIST: K.S. FLECK

GEOPHYSICAL DATA	FROM	TO
LOG XX		
DENSITY:	85	225
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY: SEAM	THICK	INT.
BC	8.8	78.4
HIA.	7.1	

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX #	RUN #	% REC.	SAMPLE
0					0 - 50(?) ALLUVIUM, MOSTLY SOIL WASHED AWAY, RECOVERED PORTION SS BOULDERS 1-2' DIAM.					
								7.5	0	
10									32	
								17.5		
20							1		18	
								27.5		
30									16	
								37.5		
40									25	
							45.5			
								47.5		
50					[illegible] SANDSTONE, [illegible]		2		32	
								57.5	57.5	
60									16	
								66.5		
70							3		72	

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

PACIFICORP ELECTRIC OPERATIONS
FUEL RESOURCES
COAL LITHOLOGIC LOG

PROJECT: EAST MOUNTAIN
DRILL HOLE: EM-158
PAGE 2 of 3

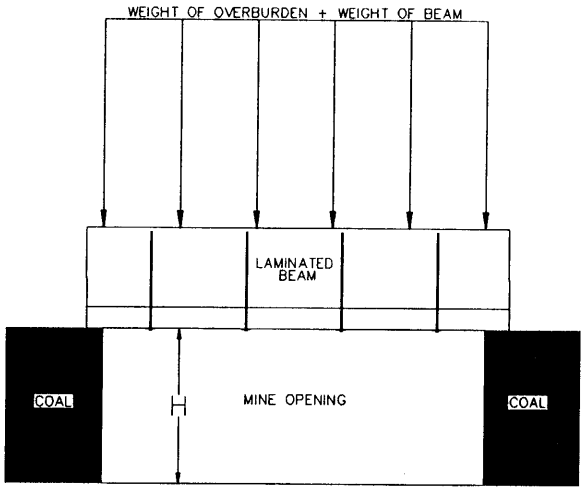
DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX #	RUN #	% REC.	SAMPLE
70						20	3	8	72	
					72.5 - 77.9 MUDSTONE, SILTY, WEATH., COARSER TO SILTSTONE BELOW					
					77.9 - 81.3 SANDSTONE, VFG., w/ 20% MS INTERBEDS					
80					VERT. WEATH FRAC 77.9-81.0	16				
					81.3 - 109.6 SANDSTONE, M.G., MASSIVE, OCC. COAL LAMS, BUFF-TAN, SL. WEATH. SL. SUGARY BECOMES COARSE @ BOTTOM		4	9	94	
							86.5	96.5		
90						6	5	10	100	
							96.5	96.5		
100					OBLIQUE WEATH. FRACTURE @ 101.9-102.1	7	6	11	100	
							106.5	106.5		
					ABRUPT CONTACT, PLATY MS LAM.					
110					109.9 - 110.6 SANDSTONE VFG., OCC CARB & MS LAMS					
					110.6 - 111.2 INTERBEDS, MS 70% SS 30% SLIPLATY, BURROWED					
					111.2 - 111.9 SANDSTONE F.G., MASSIVE, HARD		7	12	99	
					111.9 - 116.0 INTERBEDS, SANDSTONE 55% MS 45% OCC. PLATY, FRACTURED					
							116.5	116.5		
				ABRUPT	116.0 - 117.1 SANDSTONE F.G., w/MS INT. 10% PLATY					
					117.1 - 125.9 COAL, BLIND CANYON					1 117.1
120			COAL		MEAS. 55 [illegible] FIELD V. [illegible] TOP 51 RES. NEXT 2' 55 [illegible] 55 V. RES NEXT 1'		8	13	102	2 119.5 3 120.3 4 122.1 5
					120.7-121.2 LAMINED (2 RAN?) 122.9-123.1 BRANCH [illegible]					
					125.7-126.0 BONE, CMS SANDY		126.0			
				ABRUPT	126.0-128.9 SILTSTONE, MUDDY HD. CARB STKS & TOP					
130					128.9 - 134.0 SILTSTONE, w/MS INT., MUDDIER & PLATIER [illegible] THROUGH-OUT, [illegible] BLOCKY & BROKEN [illegible]		9	14	98	
					134.0-136.5 SILTSTONE, SL. MUDDY, HD.		135.2	136.5		
				ABRUPT	136.5-137.0 CMS BLACK COALY, V. PLATY					
					137.0-137.1 SILTSTONE MUDDY, HD.					
140					137.1-147.5 MUDSTONE, LT-DK GRAY V. SOFT ZONES @ 143.7-143.8, 144.0		10	5	90	
					147.5-148.5 SILTSTONE, LIGHT, HARD, GRADES INTO SS.		147.5			
				GRAY	148.5-155.7 SANDSTONE F M.G., MASSIVE		11	13	100	
150							155.6	156		
				ABRUPT	CLAYEY					
160					155.7-[illegible] MUDSTONE GRAY, MD., SILTY					

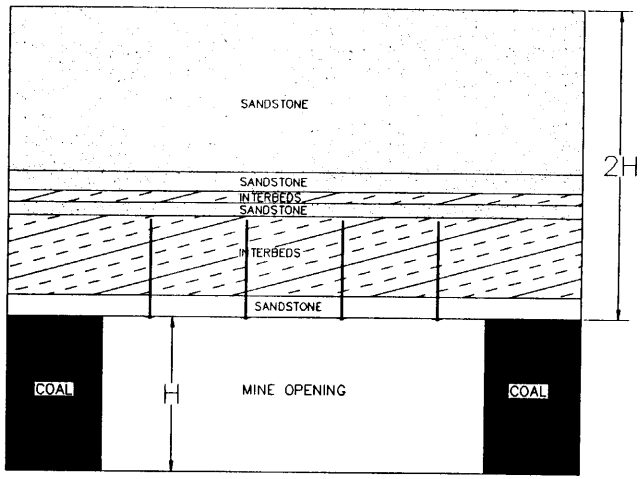
INCORPORATED
EFFECTIVE
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

Attachment #2

Stress Distribution in Laminated Beam

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING





INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

RECEIVED
MAY 14 1997
DIV. OF OIL, GAS & MINING

CAD FILE NAME/DISK#: BEAM

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
RIGHT FORK OF RILDA CANYON
BEAM ANALYSIS

DRAWN BY:	VAN RIDING		
SCALE:	1"=10'	DRAWING #:	
DATE:	MARCH 19, 1997	SHEET 2 OF 2	REV. ___

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

R645-301-500 ENGINEERING SECTION

APPENDIX B

♦CORRESPONDENCE LETTERS

APPENDIX 2

VOLUME 11

R645-301-500
ENGINEERING

991B

CONTENTS

Utah Division of Oil, Gas, and Mining Conditional Approval Letter

USFS Letter of Consent and Decision Memo

Utah Division of Wildlife Resources Letter of Approval

UDOT Encroachment Permit

Emery County Road Encroachment Permit

North Emery Water Users Association Approval Letter

Rilda Road Evaluation

QQB

UTAH DIVISION OF OIL, GAS, AND MINING CONDITIONAL APPROVAL LETTER

99B

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

October 22, 1999

Chuck Semborski, Environmental Supervisor
Energy West
P. O. Box 310
Huntington, Utah 84528

Re: Conditional Approval of Rilda Canyon Access, PacifiCorp, Deer Creek Mine, ACT/015/018-99B, File #2, Carbon County, Utah

Dear Mr. Semborski:

The Division has completed the review of your proposal to access the Deer Creek Mine by way of Rilda Canyon. Your submittal dated October 7, 1999 adequately addressed the deficiencies previously sent to you on August 5, 1999. The Division hereby approves your application contingent upon the following conditions being completed.

1. Seven clean copies of the amendment must be submitted to the Division by no later than November 22, 1999 for incorporation into the approved Mining and Reclamation Plan and for distribution.

2. Prior to using the Rilda Canyon road for access to the Deer Creek Mine, PacifiCorp must obtain the endorsement of the Manti La Sal National Forest for the design adequacy of the Rilda Canyon Road above the gate, as well as an endorsement to leave the access gate open while the mine disturbed area is being accessed.

If you have any questions regarding this approval or the conditions, please call me at (801) 538-5325 or Pete Hess at (435) 613-5622.

Sincerely,

Daron R. Haddock

Daron R. Haddock
Permit Supervisor

tm
cc: Janette S. Kaiser, USFS
Miles Moretti, Price DWR
Price Field Office
O:\015018.DER\FINAL\app99bltr.wpd

99B

USFS LETTER OF CONSENT AND DECISION MEMO

United States
Department of
Agriculture

Forest
Service

Manti- La Sal
National Forest

Supervisor's Office
599 West Price River Drive
Price UT 84501
Phone # (435) 637-2817
Fax # (435) 637-4940

File Code: 2820-4

Date: October 25, 1999

Mary Ann Wright
Utah Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Dear Mary Ann:

We have reviewed Energy West's Mine Plan Amendment, subsequent submissions, and the Division's Technical Analysis regarding the proposal to haul bulk materials to the Deer Creek Mine via the Rilda Canyon Left Fork breakout and access road.

We hereby consent to approval of the amendment by the Division subject to the following provisions/modifications:

- Modify Stipulation 10 on page 43 of the permit amendment to "Usage of the Rilda Canyon Road will be limited to the period from April 15 through December 1 or as directed by the Utah Division of Wildlife Resources to protect the winter range and raptors and as directed by the Forest Service to protect National Forest System resources."
- Snow removal on the breakout access road is limited to Forest Service case-by-case approval, to remove drifts which remain after the remainder of the road is clear of snow and has dried sufficiently to allow hauling which would not cause rutting or other damage.
- The Forest Service reserves the right to stop hauling at any time due to unforeseen public safety concerns or site specific conditions such as resource damage, fire, or road damage.
- The operator is responsible to prevent any unauthorized use of the breakout access road during hauling and at all other times by appropriate actions, signs, gates, and barricades, subject to Forest Service concurrence.
- A dust suppression method (other than just watering) must be implemented after the 1999 field season to minimize the number of truck trips on the breakout access, subject to Forest Service approval.

A copy of the Forest Service Decision Memo for this proposal is attached for your information.

G913

Modifications to the plan may be necessary at the end of the test period on December 1, 1999, to address concerns. The Forest Service must be consulted regarding modifications to the amendment or additional requirements needed to address concerns.

If you have any questions, please contact Jeff DeFreest or Carter Reed at the Forest Supervisor's Office in Price, Utah.

Sincerely,

for
JANETTE S. KAISER
Forest Supervisor

Enclosure

cc:
Bob Willey, Energy West
P.O. Box 310
Huntington, Utah 84528

Pete Hess, Utah Division of Oil, Gas and Mining
Price Field Office, 451 East 400 North
Box 156
Price, Utah 84501

Jeff DeFreest, D-2/3

Brent Barney

GAB

Decision Memo

PACIFICORP/ENERGY WEST
BULK MATERIALS HAULING ON RILDA CANYON ROAD
DEER CREEK MINE

USDA Forest Service, Intermountain Region
Manti-La Sal National Forest
Ferron-Price Ranger District
Emery County, Utah

I. INTRODUCTION

The Manti-La Sal National Forest has evaluated a proposal by Energy West, Deer Creek Mine to haul bulk materials to their breakout portal and pad in the South Fork of Rilda Canyon. The proposal would allow Energy West to haul the proposed materials via existing surface roads which is less costly than hauling them through the underground workings from the Deer Creek Mine portal complex. The subject roads and the breakout pad already exist and are under appropriate permits. Hauling on State highways has been approved by the Utah Department of Transportation. Hauling on the County road in Rilda Canyon from State Hwy. 31 to the breakout pad access road has been approved by Emery County through issuance of an encroachment permit. No expansion or reconstruction of these facilities on National Forest System lands is proposed or reasonable foreseeable. The facilities on National Forest System lands have been determined to be suitable for the proposed activity. Bulk materials to be hauled to the breakout portals and pad would consist of longwall support CANS/cribs, gravel, and Omega block. Hauling would consist of a maximum 28 loads per week (average of 5.4 trucks per day). Only one truck would be in the canyon at a time and hauling would be limited to the period between April 1 and December 1 as weather permits. The actual start and stop time between these dates would be subject to approval by the Division of Wildlife Resources and Forest Service based on weather, wildlife activities in the canyon, and road conditions. No hauling would take place on weekends, holiday weekends (including the prior Friday and actual holiday) or the openings of the general big-game hunting seasons (including the day prior to the opening day). Hauling would not take place when the road surface is wet enough to be susceptible to damage and would be limited to daylight hours. No hauling of materials from the breakout pad would take place. Some of the CANS and gravel would be stockpiled on the pad in approved areas but most materials would be transported into the mine as they are unloaded from the trucks. The area of the proposed action lies on National Forest System lands administered by the Ferron-Price Ranger District of the Manti-La Sal National Forest. The breakout and breakout pad access road occupy approximately 2 acres of National Forest System lands and are located in Section 9, Township 16 South, Range 7 East, Salt Lake Meridian, in Emery County, Utah, within Federal Coal Lease U-050862 and U-06039, within the approved permit boundary of the Skyline Mine.

The proposal was submitted to the Utah Division of Oil, Gas and Mining in the form of a permit amendment to the Mine Permit for the Deer Creek Mine. Forest Service consent is required under the Federal Coal Leasing Amendments Act of 1975, Surface Mining Control and Reclamation Act of 1977 and associated Federal Regulations, and the Utah Coal Rules. The Forest Service consent decision is subject to analysis under the National Forest Management Act of 1976, and National Environmental Policy Act of 1969.

II. DECISION

I have decided to consent to approval of the proposed hauling by the Utah Division of Oil, Gas and Mining as proposed by Energy West subject to the attached provisions for the protection of non-coal resources on National Forest System lands.

It is my determination that this decision may be categorically excluded from preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) under Forest Service Handbook 1909.15, Chapter 30, Section 31.2(3): "Approval, modification, or continuation of minor special uses of National Forest System lands that require less than five contiguous acres of land." This category was determined appropriate because the area affected by this decision is less than 5 acres, no impacts to surface resources or hydrology are anticipated, and surface uses would remain essentially the same.

99B

My decisions will be implemented via this Decision Memo and subsequent consent letters that will be sent to the the Director, Utah Division of Oil, Gas and Mining.

III. DECISION RATIONALE

This decision was made after careful consideration of the proposal, public involvement, and the entirety of the supporting record. No one fact or single piece of information led to the decisions. Rather, a combination of factors contributed to it. The key considerations are discussed in the following sub-parts:

Attainment of Agency Goals:

The general purpose and need for this project is to accomplish the following goal of the Forest Plan: "Provide appropriate opportunities for and manage activities related to locating, leasing, development, and production of mineral and energy resources." (Forest Plan, p. III-4). Another related goal of the Forest Plan is: "Manage geologic resources, common variety minerals, ground water, and underground spaces (surficial deposits, bedrocks, structures, and processes) to meet resource needs and minimize adverse effects."

The proposal lies within an MMA (Minerals Management) and an RNG (Range) Forest Plan Management Unit. MMA Management Units are managed with emphasis on leasable mineral operations such as coal mining operations. RNG Management Units are managed for emphasis on Livestock and Wildlife Grazing. Mineral activities are allowed with appropriate mitigations to assure that operations are consistent with Forest Plan goals for management of resources.

The project-specific purpose and need of the proposed action is to provide for economical mineral activities while protecting natural resources of the National Forest consistent with Forest Service policy and Forest Plan direction.

The decision wholly meets the project's purpose and need.

Absence of Extraordinary Circumstances:

Existing resource conditions and potential extraordinary circumstances have been considered in making the decisions.

Steep slopes or highly erosive slopes. The proposed project areas are located in the bottoms of canyons away from steep slopes and highly erosive slopes.

Threatened and endangered species or their critical habitat. The project will involve hauling of materials on existing roads during non-critical periods of time regarding wildlife habitat and occupation. No water will be used, depleted, or diverted. There should be no impact to any species.

Floodplains, wetlands, or municipal watersheds. There will be no use, depletion, or diversion of the water. There should be no effect on the floodplain or wetland.

Congressionally designated areas, such as wilderness, wilderness study areas, or National Recreation Areas. There are no wilderness, wilderness study areas, or National Recreation Areas in or adjacent to the project area.

Inventoried roadless areas. The project area is not within an inventoried roadless area or an unroaded area contiguous to an inventoried roadless area.

Research Natural Areas. The project area is not located within any Research Natural Areas (RNAs).

Native American religious or cultural sites, archeological sites, or historic properties or areas. Because the hauling would be on existing roads and would not involve additional surface disturbance, professional archaeological staff have determined that the project does not have the potential to affect historic properties.

Relationship to Public Involvement:

Public comments were sought through scoping and considered throughout the planning process for this project. Project scoping responses are described in the next section.

99B

IV. PUBLIC INVOLVEMENT

Legal notices describing the proposal and requesting issues/comments were published in the *Sun Advocate* (Price, Utah) and the *Emery County Progress* (Castle Dale, Utah) on June 8, 1999. Letters describing the proposal and requesting issues/comments were mailed to 18 interested individuals/agencies on June 7, 1999. Four response letters were received with comments as described below.

Utah Mining Association - Supports approval of the requested permit amendment to preserve the Carbon and Emery County economies and their standard of living.

Utah Division of Wildlife Resources - Stated that restricting hauling to the period between April 15 and December 1 as proposed would be sufficient to protect wildlife.

North Emery Water Users Association - Objected to transporting of any hazardous materials (oil, greases, fuels, etc.) on the Rilda Canyon Road due to the potential for a wreck or spillage. The Rilda springs which lie downstream of the breakout in Rilda Canyon adjacent to the road and have been developed by North Emery Water Users Association to provide culinary water and are directly influenced by the creek above. Any spillage could contaminate the springs.

Emery Water Copnservancy District - First the District is concerned that the increased truck traffic on the existing road will have a definite negative impact on the environment in the area. We do not see an evaluation of protective measures to be taken to prevent pollution to the streams due to road sediment seeping into the system. Second, it appears that no time table has been expressed as to how long the road will be in use and what will become of this access road when it's use is no longer necessary. Third, we question what guarantees have been put into place that this road will be used only for hauling bulk materials. It is the main emphasis and concern of the Emery Water Conservancy District that the water and the watershed within the forest boundaries be protected.

A meeting at the Forest Supervisor's Office in Price, Utah was held on July 23, 1999 between the Forest Service and water users groups. North Emery Water Users Association and Emery Water Conservancy District were represented. The proposed project was discussed. Both groups agreed that if their concerns were addressed they would have no objection to Forest Service consent to the proposal. It was explained that Energy West has not proposed to haul anothing other than the bulk materials discussed in the introduction of this Decison Memo and would not be allowed to haul any other materials without specific approval of the responsible agencies. In addition, Energy West would be required to install some additional sediment control facilities on the road and would be required to supress fugitive dust with water or some other method approved by the agencies. It was explained that the road and pad are already permitted under the Deer Creek Mine plan which includes restrictions on use of the road and requires complete reclamation of the breakout facilities, pad, and access road upon completion of mining activities. There is an adequate bond held by the Utah Division of Oil, Gas and Mining to ensure compliance. Additional concerns were brought up by the group regarding public safety and adequacy of the road to protect a spring which is located under the road which provides water to their collection system.

V. FINDINGS REQUIRED BY OTHER LAWS AND REGULATIONS

To the best of my knowledge, the decision complies with all applicable laws and regulations. In the following, the association of the decision to some pertinent legal requirements are summarized.

National Forest Management Act of 1976: The Forest Plan was approved November 5, 1986, as required by this Act. This long-range land and resource management plan provides guidance for all resource management activities in the Forest. The National Forest Management Act requires all projects and activities to be consistent with the Forest Plan. The Forest Plan has been reviewed in consideration of this project. The decision will be consistent with the Forest Plan.

Coal Leasing Amendments Act of 1975: Forest Service consent to approval of mining operations by the Utah Division of Oil, Gas and Mining (including conditions for protection of non-coal resources) is required under this act. Approval of this decision memo constitutes my consent to UDOGM.

Surface Mining Control and Reclamation Act of 1977(SMCRA): This act gives the Department of the Interior, Office of Surface Mining (OSM), primary responsibility to administer programs that regulate surface coal mining

operations and the surface effects of underground coal mining operations. Pursuant to sections 503 and 523 of SMCRA, under the oversight of the OSM, the Utah Division of Oil, Gas and Mining regulates surface coal mining and the surface effects of underground coal mining on Federal and non-Federal lands within the State of Utah. On National Forest System lands, consent must be obtained from the Forest Service, as the surface management agency, prior to approval of mining activities, including exploration drilling. Approval of this decision document constitutes my consent for approval of the mine permit amendment.

National Historic Preservation Act: The proposal would not result in any impacts for cultural or historic resources.

Endangered Species Act: The Biological Assessment/Biological Evaluation has disclosed that this project will not result in impacts to threatened, endangered, or sensitive plant or animal species. Therefore the Forest Biologist determined there is no need to further evaluate threatened, endangered, or sensitive plant or animal species.

National Environmental Policy Act: The entirety of documentation for this project supports that the project analysis complies with this Act.

VI. IMPLEMENTATION DATE AND APPEAL OPPORTUNITY

Implementation of the these decisions may occur immediately upon my signature of this document.

This decision is not subject to appeal by the public in accordance with the Code of Federal Regulations Title 36 part 215.

This decision is subject to appeal by the applicant under Code of Federal Regulations Title 36 part 251.

VII. CONTACT PERSON

For additional information concerning the Forest Service decision, please contact Carter Reed or Jeff DeFreest at the USDA Forest Service, Manti-La Sal National Forest (address: 599 West Price River Drive, Price, UT 84501; telephone: 435-637-2817).

VIII. SIGNATURE AND DATE

for

JANETTE S. KAISER
Forest Supervisor
Manti-La Sal National Forest

10/22/99
Date

99B

DECISION MEMO ATTACHMENT

CONDITIONS OF FOREST SERVICE CONSENT

- No petroleum products, liquids (other than specifically approved dust suppression products), or hazardous materials of any kind will be hauled on the breakout access road.
- Hauling will be limited to the time between April 15 and December 1. In addition, the actual start and stop dates are subject to Forest Service consent based on weather, National Forest System resources, and road conditions. The Forest Service reserves the right to stop hauling at any time due to unforeseen public safety conditions or site specific conditions such as resource damage, fire, or road damage.
- Snow removal on the breakout access road is limited to Forest Service case-by-case approval, to remove drifts which remain after the remainder of the road is clear of snow and has dried sufficiently to allow hauling which would not cause rutting or other road damage.
- No hauling will take place during holidays (Federal and State), holiday weekends (including the prior Friday), the opening weekends or the general big-game hunts (including the prior Friday).
- The operator is responsible to prevent any unauthorized use of the breakout access road during hauling and at all other times by appropriate actions, signs, gates, and barricades, subject to Forest Service concurrence.
- A dust suppression method (other than just watering) must be implemented to minimize the number of truck trips on the breakout access, subject to Forest Service approval, beyond the 1999 field season.

99B

UTAH DIVISION OF WILDLIFE RESOURCES LETTER OF APPROVAL

99B

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
John Kimball
Division Director

Southeastern Region
475 West Price River Drive, Suite C
Price, Utah 84501-2860
801-636-0260
801-637-7361 (Fax)

9 June, 1999

Joseph C. Helfrich
Permit Supervisor
Division of Oil, Gas and Mining
PO Box 145801
SLC, UT 84114-5801

RE: DWR comments on the Rilda Canyon Surface Access Amendment, ACT/015/018, Emery Co. UT

Dear Mr. Helfrich,

The Division of Wildlife Resources has reviewed the amendment to allow surface access to the Rilda Surface Facilities and have the following comments:

- We **support** the stipulation which limits usage of the Rilda Canyon Road from April 15th through December 1st. This stipulation was requested to avoid impacts to big game during the critical winter period.

- We request that stipulation 10 on page 43 be **reworded** to state: "10. Usage of the Rilda Canyon Road will be limited to the period from April 15 through December 1, or as directed by the Utah Division of Wildlife Resources *to avoid impacts to big game during the critical winter season.*" This wording change would more accurately represent the purpose of this restriction.

- Finally, we **understand that PacifiCorp does not anticipate further development** at the Rilda Canyon Facilities (pg. 43). We feel that this is an important point, as we are concerned about the cumulative impact of projects in this area. The combination of this, and additional future projects in this area may have a greater impact on wildlife than anticipated by analyzing projects individually.

Thank you for the opportunity to review and comment on this amendment. We appreciate the opportunity to work with PacifiCorp, DOGM and the Forest Service on this amendment from its inception. For questions regarding these comments, please contact Chris Colt - Habitat Biologist at (435) 636-0279.

Sincerely,

Kevin H. Berg for Miles Moretti

Miles Moretti
Regional Supervisor

c:Pete Hess - DOGM
Bob Willey - PacifiCopr
Jeff DeFreest - USFS

99B

UDOT ENCROACHMENT PERMIT

99B

ORIGINAL

UTAH DEPARTMENT OF TRANSPORTATION

T-226(6/97)
HIGHWAY RIGHT OF WAY
ENCROACHMENT

PERMIT

99-671-44
Date: 10/01/1999

Work order #:

Region 4
District: Price

Application of: ENERGY WEST MINING CO.

Phone: 687-4720

Title: GEOLOGY/PERMITTING SUPVR

By: CHARLES SEMBORSKI

Address: PO BOX 310, HUNTINGTON UT 84528

is hereby granted, subject to UDOT's Regulations For The Accommodation of Utilities on Federal Aid and Non Federal-Aid Highway Right of Way, Regulations for the Control and Protection of State Highway Rights of Way, Standard Specifications for Road and Bridge Construction, Specifications for Excavation of State Highways, State Occupational Safety and Health Laws, Manual on Uniform Traffic Control Devices, Instructions to Flaggers, the approved plans, and any special limitations set forth herein, permission for the purpose of **ACCESS SR-31 FROM EMERY COUNTY ROAD #306 WITH TRACTOR/TRAILER FOR THE PURPOSE OF TESTING FEASIBILITY OF DELIVERY OF MATERIALS TO THE DEER CREEK MINE** within the right of way limits of Highway No. **31** Milepost No. **38.7**, in **EMERY** County, in the following locations: **HUNTINGTON CANYON, INTERSECTION OF SR-31 AND EMERY COUNTY ROAD #306**.

Receipt of $20.00 permit fee is hereby acknowledged. The work permitted herewith shall commence **10/04/1999** and shall be diligently prosecuted to completion. The work shall be completed and all disturbed surfaces or objects restored on or before **11/30/1999**. In the event work is commenced under this permit and the permittee fails or refuses to complete the work, the Utah Department of Transportation may, at its election, fill in or otherwise correct any existing deficiencies at the expense of and subject to immediate payment by the permittee.

Permittee shall execute a bond in the minimum amount of **$0.00**, as determined by the Region Director/District Engineer, to insure faithful performance of the permittee's obligation. The bond shall remain in force for three years after completion of work.

Before work permitted herewith is commenced, the permittee shall notify Dale Stapley at 636-1402, permits officer, or **Steven Acerson 687-9969**, and commencement of said work is understood to indicate that the permittee will comply with all instructions and regulations of the Utah Department of Transportation (as listed above) with respect to performance of said work, and that he will properly control and warn the public of said work to prevent accident and shall indemnify and hold harmless the Utah Department of Transportation from all damages arising out of any and all operations performed under this Permit.

Permittee shall not perform any work on State Highway right of way beyond those areas of operations stipulated on this permit.

If permittee fails to comply with Utah Department of Transportation regulations, specifications, or instructions pertinent to this permit, the Region Director/District Engineer or his duly authorized representative, may by verbal order, suspend the work until the violation is corrected. If permittee fails or refuses to comply promptly, the Region Director/District Engineer or his authorized representative may issue a written order stopping all or any part of the work. When satisfactory corrective action is taken, an order permitting resumption of work may be issued.

Special Limitations: This agreement and/or permit is UDOT approval only. You are responsible to obtain clearances from private property owners and the local jurisdiction you are working within. Contractor responsible for repairing and/or restoring any portion of the roadway damaged during construction. TRUCKS ENTERING HIGHWAY SIGN TO BE POST MOUNTED WITH ORANGE FLAGS APPROX. 1000' IN ADVANCE OF RILDA CANYON. CERTIFIED FLAGGER TO DIVERT RILDA CANYON TRAFFIC (NOT SR-31 TRAFFIC)

See Application for Signature
(Signature of Permittee)

Approved By: Dale Stapley
For (Region Director/District Engineer)

Maintenance Station No. 433 Steven Acerson 687-9969

Form T-223

UTAH DEPARTMENT OF TRANSPORTATION

Application for Right of Way Encroachment Permit

(WORK CANNOT BEGIN UNTIL PERMIT IS APPROVED)

Date 9-30, 19 99

To: Region Director/District Engineer
UTAH DEPARTMENT OF TRANSPORTATION

*(1) Application is hereby made by: Energy West Mining Co - Charles A. Semborski
*(2) Address: PO Box 310 Huntington UT 84528 Tel. No. (435) 687 4720
*(3) for permission to do the following: Ent Access State Highway 31 from Emery County Road #306 with tractor/trailer for the purpose of testing feasibility of delivery of materials to the Deer Creek Mine - Rilda Canyon Surface Facility
*(4) Location: Huntington Canyon - Intersection of State Highway 31 + Emery County Road #306 (Rilda and Trail Canyons / ERD # 50246)

City _____ County Emery Highway No. 31
Milepost _____ in accordance with the attached plan *(5)

*(6) Construction will begin on or about 10/4, 19 99
and will be completed on or before 11/30, 19 99.

New underground utility installations crossing highway must be placed by boring. If boring is impossible due to unusual circumstances such as soil conditions, existing utilities, etc., a request for an exception may be made to the Region Director/District Engineer and the following information provided:

a. Type of pavement Not Applicable
b. Excavation will be N/A feet long by N/A feet wide and N/A feet deep.
c. A bond in the amount of $ _____ has been posted with _____ Tel. No. _____ to run for a term of three (3) years after completion of work to guarantee satisfactory performance.

If this permit is granted, we agree to comply with all conditions, restrictions and regulations contained in the UDOT Policy 08-87 "Accommodation of Utilities on Federal-Aid and Non Federal-Aid Highway Right of Way", and "Special Limitations" required by the Region Director/District Engineer or his duly authorized representative.

Energy West Mining Co
Developer

Charles A Semborski
Type or Print Name — Permittee

Charles A. Semborski
Signature

Geology / Permitting Supervisor
Title

*Refer to instructions on back.

To be filled in by the Region Director/District Engineer:
Permit _____ should _____ should not be granted.
Special Limitations _____

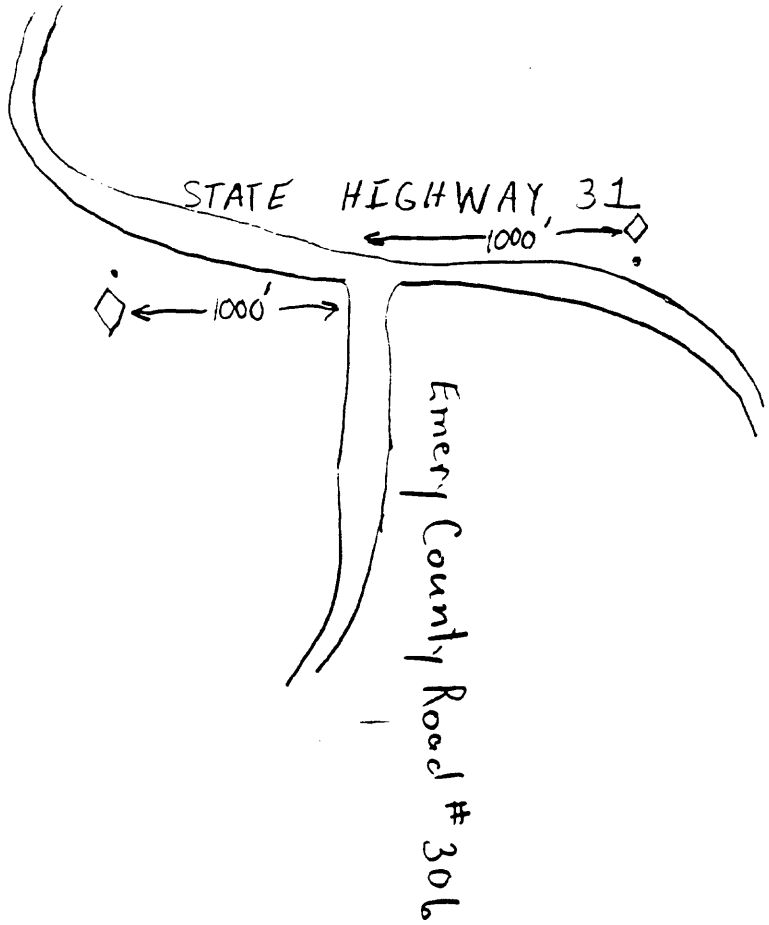
Region/District Traffic Engr. _____ Region Director/District Engineer _____

993

Energy West Mining Co. 9/30/99

UDOT Encroachment Permit

Intersection State Highway 31 and Emery County Road # 306



◊ Traffic Signs Located on State Highway 31 approximately 1000 FT from intersection with Emery County Road #306. Sign To Be 48 in² diamond Black on Yellow (Truck Crossing) with Black on Yellow 8"X24" (1000 FT)

• Certified flag person located in best location to control access of trucks from Emery County Road #306 onto State Highway 31. Traffic will be to and from the direction of Huntington UT.

99B

INSTRUCTIONS

1. Application for this permit should be made by whoever will actually do the work, whether it be the owner or a contractor.

2. Mailing address of applicant.

3. State fully and completely the type of installation, type of construction, with, thickness, drainage data, etc., where applicable.

   If a pole line, give the following information: number of poles, total length of line, type of wire, character of service, vertical clearance over the roadway, and voltage if power line.

   If a pipe line or buried cable, give the following information: type of service, size and length of line, depth of trench, kind of pipe (sewer, gas, oil, water supply, etc.) or conduit. All transverse underground utilities must be placed under the pavement by boring. All fluid lines require encasement with suitable material. The size and length of encasement shall be satisfactory to the Utah Department of Transportation.

4. Give distance from some geographical point such as intersecting highways, city or corporate limits. Give city, county, and state or U.S. route number.

5. Attach two (2) copies of a plan showing proposed locations of structures with reference to pavement and right of way lines. If installation crosses the highway, show cross section of present roadway and proposed installation. Identify the location of other utilities that may be in conflict.

6. Give anticipated dates for beginning and for completion of proposed installations. These will be used in determining the inspection fee.

Note: A fee of twenty dollars ($20.00) will be charged for all Right of Way Encroachment Permits. This permit fee shall be submitted with the application. An inspection fee will also be required as outlined in UDOT Policy 08-87 "Accommodation of Utilities on Federal-Aid and non Federal-Aid Highway Rights of Ways".

UTAH DEPARTMENT OF TRANSPORTATION REGION / DISTRICT OFFICE ADDRESSES:

Region 1 - 169 North Wall Avenue / P.O. Box 12580, Ogden, Utah 84412-2580, (801) 399-5921

Region 2 - 2010 South 2760 West, Salt Lake City, Utah 84104-4592, (801) 975-4900

Region 3 - 825 North 900 West, Orem, Utah 84057, (801) 227-8000

Region 4 - 1345 South 350 West / P.O. Box 700, Richfield, Utah 84701, (435) 893-4710

Cedar City District - 1470 North Airport Road / P.O. Box 1009, Cedar City, Utah 84721-1009, (435) 865-5500

Price District - 940 S. Carbon Ave, Price, Utah 84501-0903, (435) 636-1470

Richfield District - 708 South 100 West, Richfield, Utah 84701, (435) 896-1399

99B

EMERY COUNTY ROAD ENCROACHMENT PERMIT

QFB

EMERY COUNTY
A Great Place to Live and Work

Road Department

PERMIT

Permit #199928

Application having been made by Energy West Mining Company through Charles A. Semborski, its authorized agent, and fees and a bond being waived, and the Application having been reviewed and accepted, permission is hereby granted Applicant to proceed with the testing transportation of materials to the Rilda Canyon surface facility of Deer Creek Mine. Located on the Rilda Canyon Road #306.

Stipulations:

1. Dust control during hauling period.
2. Proper signing while hauling is in effect.
3. Posting for safety during hauling and traffic control (if needed).
4. Road repairs in the event of damages.
5. Final inspection upon completion of hauling.
6. Strict compliance with Ordinance 8-7-85A or as amended, Road Supervisor and County Engineers.
7. Must be in compliance with Utah Department of Transportation through Dale Stapley.

DATED this 4th day of October, 1999.

Supervisor

EMERY COUNTY ROAD DEPARTMENT

By

INSPECTION AND RELEASE

The Emery County Road Department Supervisor inspected said site on the _____ day of _____, 19 _____, finds the following:

___ Deficiencies which must be corrected before release can be considered.

___ Released

Supervisor

EMERY COUNTY ROAD DEPARTMENT

By _____

Person to Contact:

Name: Chuck Semborski/Bob Willey

Address: P O Box 310

Phone #: (435) 687-4720/687-4722

99B

P.O. Box 889 • 300 North 1st West • Castle Dale, Utah 84513 • Telephone (801) 381-5450 • FAX (801) 381-5239

NORTH EMERY WATER USERS ASSOCIATION
APPROVAL LETTER

99B

NORTH EMERY
WATER USERS ASSOCIATION

Box 129
Cleveland, Utah 84518
Telephone (801) 653-2649

October 12, 1999

Charles A. Semborski
Geology/Permitting Supervisor
Energy West Mining Company
P. O. Box 310
Huntington, Utah 84528

Mr. Semborski:

On October 4, 1999 several board members of the North Emery Water Users Association and I met with representatives from Energy West Mining Company to discuss the delivery of material to the Rilda Canyon surface facilities of Deer Creek Mine. Energy West Mining Company has requested permission from the Utah Division of Oil, Gas, and Mining, in conjunction with the United States Forest Service, to conduct a test to determine the feasibility of delivering solid bulk materials to the North Rilda portal facility. After discussing concerns related to the test proposal with Energy West representatives, North Emery Water Users Association supports approval of Energy West Mining Company's request to conduct a material haulage test to the Rilda Canyon portal facilities of the Deer Creek Mine. The material haulage test will be completed by December 1, 1999.

Sincerely,

Menco Copinga
President
North Emery Water Users Association

99B

RILDA ROAD EVALUATION

9913

ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

October 1, 1999

United States Forest Service
Manti-La Sal National Forest
599 West Price River Road
Price, Utah 84501

Attention: Mr. Carter Reed

Re: Rilda Canyon Facilities Access Road

Attached you will find the report "Geotechnical Evaluation and Design Services for the Rilda Canyon Project" which includes the facility pad and access road. The report was prepared by Geotechnical Design Services. Also included, are drawings showing design details of the road. The signed and dated copies of these drawings can be found in the Deer Creek MRP in packets 3-9A, 3-9B and 4-4A. The road was constructed according to this information.

The following lists access road use since it's construction.

- During construction of the facility, Energy West imported approximately 9000 cubic yards of 2" granular material for sub-grade and fill for construction of the site. As can be seen on the attached weight tickets, the belly-dump trucks had a gross weight of 80,000 to 95,000 lbs. This equated to approximately 70 to 80 trips on the access road.
- Approximately 20 tractor/trailer loads were delivered to the site, including 38,000lbs. Transformers (2ea.), 100,000 gallon water tank, two Sub-station building halves, fan ductwork, fans, 1000 h.p. motor, etc.
- Also during construction we poured approximately 300 cubic yards of concrete, with some trucks hauling 11 yards/load.

The gross weight of the truck hauling the can cribs is 78,000 lbs and the gravel trucks/trailer will be approximately 80,000 lbs. As stated in our application for use of this road, "The road will not be used when wet and susceptible to damage." This will prevent damage to the top course of enzyme treated road base.

If you have any additional questions please contact me.

John Christensen

John Christensen
P. E. 165651, Utah
Sr. Construction/Industrial Engineer
Energy West Mining
15 N. Main
Huntington, Utah 84528
435-687-4725
Email: john.christensen@pacificorp.com

99B

R645-301-500 ENGINEERING SECTION

APPENDIX C

♦ENVIRONMENTAL ASSESSMENT FOR DEER CREEK MINE NORTH RILDA EXTENSION

Environmental Assessment
for
Deer Creek Mine
North Rilda Extension

Manti-La Sal National Forest
Ferron-Price Ranger District
Emery County, Utah

July 1999

Responsible Officials: Janette S. Kaiser
Forest Supervisor
Manti-La Sal National Forest

Dick Manus
Field Office Manager
Price Field Office
Bureau of Land Management

Cooperating Agency: Office of Surface Mining
Denver, Colorado

ID Team Leader: Jeffrey Wade DeFreest, PG
District Geologist, IDT Leader

INCORPORATED
COB
UTAH DIVISION OIL, GAS AND MINING

Table of Contents

		page
Chapter 1	Purpose and Need	I-1
Chapter 2	Description of Alternatives	II-1
Chapter 3	Description of Affected Environment	III-1
Chapter 4	Environmental Consequences	IV-1
Chapter 5	Personnel & Public Involvement	V-1
Chapter 6	References	VI-1
Appendix A	General Location Map	A-1
	Project Area Maps	A-2

INCORPORATED
EFFECTIVE:
008
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 1
Purpose and Need

A. INTRODUCTION

This chapter presents the project proposal (proposed action), the purpose and need for the proposal, the decisions to be made, public involvement efforts (scoping), and the resulting issue identification.

The Utah Division of Oil, Gas and Mining (DOGM) received a proposal from Energy West Deer Creek Mine to conduct longwall mining and subsequently subside the north slope of Rilda Canyon. This permit amendment and associated revision of the resource recovery and protection plan (R2P2) are for areas within Federal coal leases U-024317, U-2810, SL-051221, and U-06039; all of which contain special coal lease stipulation # 9 from the Forest Plan. Stipulation #9 currently precludes mining that would cause the creation of hazardous conditions such as potential escarpment failure and landslides *except* at specifically approved locations. The stipulation is as follows:

> *Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The Lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.*

The Forest Service, as the surface management agency, must decide whether or not to consent to approval of subsidence of the escarpments at the north slope of Rilda Canyon by the Bureau of Land Management (BLM); and consent to the DOGM approval of the associated mine plan amendment.

Since the proposal requires amendments to Federal permits and would involve effects to National Forest System lands, the Forest Service, Manti-LaSal National Forest, will be the lead agency in the analysis. The BLM is responsible for administration of Federal Coal Leases and will participate in the analysis as a joint lead agency. The Office of Surface Mining (OSM) is responsible for administration of mine permits and will participate as a cooperating agency.

The project is located in Rilda Canyon on the Ferron-Price Ranger District within the Manti Division of the Manti-LaSal National Forest (Township 16 S, Range 7 E, partial Sections 20, 21, 28, 29). A location is mapped in Appendix A.

B. PROPOSED ACTION

The proposed action is for the cooperating agencies to allow Deer Creek Mine to conduct full extraction longwall mining and subside the escarpments on the north slope of Rilda Canyon as shown in Appendix A. The Forest Service action would be to consent to the modification of the R2P2 by the BLM, and consent to the amendment of the Mining and Reclamation Plan (MRP) with the DOGM.

Development of the proposed action included economic considerations. A detailed description of the company's proposal is outlined in Chapter 2, under Alternative 2.

INCORPORATED
UTAH DIVISION OIL, GAS AND MINING

C. PURPOSE AND NEED

The general purpose and need for this project is to accomplish the following goal of the Forest Plan: "Provide appropriate opportunities for and manage activities related to locating, leasing, development, and production of mineral and energy resources." (Forest Plan, p. III-4).

The project-specific purpose and need of the proposed action is to maximize coal recovery and extend the mine life. This purpose and need also allows the BLM to achieve maximum economic recovery of coal from the Federal Coal Leases.

D. DECISIONS TO BE MADE BY RESPONSIBLE OFFICIALS/AUTHORITY

The BLM, Price/San Rafael Field Office Manager must decide whether or not to approve the proposed amendment to the R2P2 under the Mineral Leasing Act of 1920, as amended; Coal Leasing Amendments Act of 1975; Surface Mining Control and Reclamation Act of 1977; and the Utah Coal Rules.

The Forest Supervisor, Manti-La Sal National Forest, must decide whether or not to consent to the R2P2 and resulting MRP amendment. This involves the exercising and approval/authorization as provided for in the stipulation attached to the leases.

The pending decisions must conform to the overall guidance of the Manti-La Sal National Forest Plan (1986) and its Final Environmental Impact Statement (FEIS) and the BLM's San Rafael Resource Management Plan (1992) and its FEIS. This environmental assessment tiers to the analysis decisions resulting from both EIS's which are available for review at the Ferron/Price Ranger District and the Manti-La Sal National Forest Offices and the BLM San Rafael/Price Resource Area and the Moab District Offices, respectively.

E. SCOPING

The solicitation of comments on a proposal is called scoping. The results of scoping help to identify concerns and issues about the project that will provide the main points of analysis.

Internal scoping for this project included review by various Forest Service and BLM resource specialists. External scoping consisted of notice in the Forest's *Schedule of Proposed Actions*, a Legal Notice published in the Sun Advocate (May 5th 1998), a News Release to the Sun Advocate from which an article was written about the project (May 5th, 1998), and a letter to an 18-person mailing list. Those individuals to whom letters were mailed included: Federal, State, and local governmental or land management entities; adjacent landowners and mining companies; range permittees; and others known to be potentially interested or affected. Three letters were received in response to external scoping. A letter was received from the US Fish and Wildlife Service discussing the effects of subsidence. Additionally letters of support of the project were received from the Utah Mining Association and the United Mine Workers of America. The entirety of these letters can be found in the Project Record.

INCORPORATED
UTAH DIVISION OIL, GAS AND MINING

The results of scoping identified the following initial concerns.

- *Potential Rockfalls*
- *Impacts To Water Resources*
- *Impacts To Wildlife Resources*
- *Impacts To Rangeland Use*
- *Impacts To Cultural Resources*
- *Socio-Economic Impacts*

F. ISSUES

Issues represent a synthesis of concerns expressed about the project. Issues set the scope of the project analysis. The scope of the project analysis includes the proposal, modifications to the proposal, alternatives to the proposal, and disclosure of potential effects.

The results of scoping were used to define the issues for this project. Issues are identified as either key or resolved. A key issue is one that requires an alternative to the proposal for potential resolution. It is appropriate to provide a full disclosure of anticipated effects related to a key issue. A resolved issue represents a concern resolved by the proposal through minor modifications to the proposal, project design features, or management direction (i.e. laws, regulations, policies, Forest Plan Stipulations). Sometimes discussion of anticipated effects related to a resolved issue is warranted to assist the decision maker in making a reasoned and informed decision. There were no key issues identified from the proposal.

Resolved Issues

The following issues are resolved through specific characteristics of the project area and its present use, project design features and/or management requirements. Further discussion of anticipated effects related to the following resolved issues is warranted to assist the decision maker in making a reasoned and informed decision.

Rockfalls: The proposal is likely to cause rockfalls. Rockfalls could affect visual quality, safety, vegetation, and stream sedimentation. The visual quality objective for the project area is "modification"; potential rockfalls would be within the parameters of this visual quality objective. The Colorado Rockfall Simulation Program was applied to find if toppled rocks would reach the road, and the results showed none of the 10 sample paths permitted rocks to reach the canyon-bottom road. Destroyed vegetation and increased sedimentation have been found to be negligible considering the existing condition of rocky terrain. Further discussion of this issue will address recreational use of the area, the potential hazards/risk level and project design.

Water Resources: The proposal could potentially affect water resources (Water quantity, quality, wetlands/riparian habitat, and municipal water developments). There is only one known seep (no live surface water) near the eastern end of the project area on the ridge between Rilda and Mill Fork Canyons, and it is too small to be developed for a water source. The remainder of the water resource concerns will be resolved through application of the existing coal lease stipulations and monitoring discussed in the description of the proposal in Chapter 2 and further

INCORPORATED

003
Coal Division Oil, Gas And Mining

discussed in Chapter 4. The North Emery Water Users Association spring development is outside of the project area and lies topographically and stratigraphically below the proposed project as well. It is discussed further in Chapter 3.

Wildlife Resources: The proposal could affect wildlife resources (elk and deer and their habitat , raptor habitat/nesting, threatened species, endangered species, and sensitive species).

Elk and Deer - Elk and deer use the ridge top and valley bottoms throughout the project as transitional range between summer and winter range. Subsidence and potential escarpment failure is not likely to affect either population as the escarpment creates a barrier between the ridge top and valley bottom environments. Their distribution and use of the area will be further discussed in chapters 3 and 4.

Raptors - Raptor habitat is present in the escarpments of Rilda Canyon, however no currently used nests have been located in the potential escarpment failure area and cliff nesting habitat will remain available. Further discussions can be found in chapters 3 and 4.

Threatened and Endangered Species - A Biological Assessment has been completed that discloses expected effects to those species suspected to occur within the project area. A "no effect" determination has been made. (Project Record)

Sensitive Species - A Biological Evaluation has been completed describing those species that may be impacted by the project (see chapters 3 and 4). Typically the area does not contain suitable habitat for most Sensitive Species or the overall disturbance to those species and their habitat that may occur in the area is negligible. The evaluation anticipates a "no impact" to the viability of sensitive plant and most vertebrate species. (Chapter 4, Project Record)

Socio-Economic Impacts: The Deer Creek Mine currently employs 263 miners who would potentially keep their jobs longer as the North Rilda area is mined out if the action alternative is selected. Additionally, the royalties returned to the US Treasury would be increased if the action alternative is selected. These concerns are addressed throughout the analysis for comparison purposes.

The following resolved issues are resolved through project design features and management requirements and do not warrant further discussion in this document. Referenced Stipulations are included as part of this project and can be found in the Project Record.

Rangeland Use:

Sheep:
The proposal could disturb sheep grazing operations, primarily if subsidence induced cracks cause water loss to springs on the ridge between Rilda and Mill Fork Canyons. This issue is resolved because there is only one known seep on the ridge, and it is not sufficient for development or stock watering. Additionally, sheep are only occasionally pushed that far out on the ridge and are only in there 1-2 days (if at all) due to terrain and available vegetation considerations.

INCORPORATED
EFFECTIVE
UTAH DIVISION OIL, GAS AND MINING

Cattle:
As a result of the upgrading of the Rilda Canyon Road by Emery County to the "forks area" and the construction of the Deer Creek Mine surface facility , mitigation lead to installation of a cattleguard and fence, precluding the grazing use of that portion of Rilda Canyon above the springs in the northwest 1/4 of section 28. Little range use is experienced from the mouth of the canyon up to the cattle guard and fence, primarily only during the period that the Gentry Allotment cattle are being moved onto and off the forest.

Cultural Resources: Failure of escarpment could potentially affect significant historical properties, especially prehistoric rock shelter and/or rock art sites in escarpment locales. An archeological reconnaissance of escarpment areas was conducted in 1997. Several areas were identified as having some potential to contain cultural resources. Subsequent intensive archeological survey of the areas did not locate any archeological/historical sites. Based on this data, it was determined that the project should have no effect on historic properties. Consultation was done with the State Historic Preservation Office (SHPO) and concurrence with the "no effect" finding was made (Project Record).

INCORPORATED
EFFECTIVE
COB
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 2
Description of Alternatives

A. INTRODUCTION

This chapter presents the alternatives considered for implementation, features common to action alternatives, alternatives considered but not further analyzed, and a comparative summary table of the alternatives considered for implementation responding to the identified issues.

A no action alternative and an action alternative are considered in detail.

B. ALTERNATIVE DESCRIPTIONS

Alternative 1 - No Action

Forest Service would not consent to the proposed action and mining would continue under the approved R2P2 and MRP. Subsequently, the BLM would not approve the proposed amendment to the R2P2 and DOGM would not approve the corresponding mine permit amendment. Alternative 1 addresses the need to provide a "No Action" alternative (40 CFR 1502.14) and provides a benchmark for evaluating the effects of implementing the proposal. The operator would not be permitted to conduct full extraction longwall mining under the escarpment.

Though full support mining is permitted under the current mining plan, the reserves would not be economical to mine (personal communication with Chuck Semborski, Energy West Mining Co., June 1999, and George Tetreault, BLM, July 1999). No mitigation measures or monitoring would be required as part of this alternative, beyond what is already in the mining and reclamation plan.

Alternative 2 - Consent to Mining as Proposed

This alternative wholly responds to the purpose and need.

The Forest Service would consent to the modification of the R2P2 by the BLM, and consent to approval of the amendment of the Mining and Reclamation Plan by DOGM which would allow Deer Creek Mine to conduct full extraction longwall mining and subside the escarpments in the north slope of Rilda Canyon as shown in Appendix A.

Additionally, Deer Creek Mine would post warning signs at specified points in Rilda Canyon, warning recreational users of the potential rockfall hazards, as stated in their proposal. All commitments in the mining and reclamation plan would be adhered to.

The Deer Creek Mine would also monitor subsidence through their mine plan requirements and as proposed, provide higher resolution monitoring data for the north slope of Rilda Canyon by installing prisms for accurate surveying on the top of the escarpments to determine when subsidence is substantially complete.

INCORPORATED
INSPECTOR
CCB
UTAH DIVISION OIL, GAS AND MINING

C. COMPARISON SUMMARY OF ALTERNATIVES

Responsiveness to Purpose and Need	Alternative 1	Alternative 2
Increased Recovery of Coal Reserve (Tons)	0	7,219,341
Extension of Mine Life	None	2 Years

Resolved Issues	Alternative 1	Alternative 2
Rockfalls:		
Escarpment Failure due to mining induced subsidence:		
Feet of Escarpment at High Risk of Failure	None	7,600
Feet of Escarpment at Moderate Risk of Failure	None	2,300
Feet of Escarpment at Low Risk of Failure	None	1,100
Modified Visual Quality Experience Potential	Low	High
Compliance to Forest Plan Visual Quality Objective	Yes	Yes
Safety Hazard/Risk	Low Risk	Low Risk
Destroyed Vegetation	None	Negligible
Increased Stream Sedimentation	None	Negligible
Water Resources:		
Risk of Water Quality/Quantity Loss	None	Negligible
Wetlands/Riparian Habitat Loss	None	Negligible
Risk To Municipal Watershed	None	Negligible
Wildlife Resources:		
Elk/Deer	No Impact	No Effect
Raptors	No Impact	No Effect
Threatened & Endangered		
Bald Eagle	No Effect	No Effect
Peregrine Falcon	No Effect	No Effect
Southwestern Willow Flycatcher	No Effect	No Effect
Sensitive Species		
Spotted Bat	No Impact	MIIH
Townsend's Big-eared Bat	No Impact	MIIH
Flammulated Owl	No Impact	No Impact
Northern Goshawk	No Impact	No Impact
Three-toed Woodpecker	No Impact	No Impact
MIIH = "May impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or loss of viability to the population or species"		
Socio-Economics:		
Employment years of 263 miners	4 yrs, 5 mos.	6 yrs, 5 mos.
Royalties paid to the US Treasury	$25,658,620	$37,209,566
Rangeland Use:	No Impact	No Impact
Cultural Resources	No Impact	No Impact

INCORPORATED
EFFECTIVE:
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 3
Description of Affected Environment

A. INTRODUCTION

This chapter summarizes the resources of the affected area, with emphasis on the issue topics.

This analysis tiers to the Manti-La Sal National Forest Land and Resource Management Plan (Forest Plan) Final Environmental Impact Statement (FEIS) and Record of Decision, 1986, as amended. Relevant Forest-wide and management area goals, direction, and standards from the Forest Plan are incorporated in this analysis and are further discussed in this chapter. Additionally this analysis tiers to the BLM's San Rafael Resource Management Plan (1992) and its FEIS.

B. GEOGRAPHIC AREA

The project area is within the Huntington watershed on East Mountain. Specifically, the undermining is proposed for the ridge between Rilda and Mill Fork Canyons and the north canyon slope or escarpment of Rilda Canyon. Elevations range from approximately 7,400 feet in the canyon bottoms to 9,400 feet on top of the ridge.

The Rilda Canyon Road (FDR 50246) is under the jurisdiction of Emery County. It leaves State Highway 31 near the Forest Boundary and passes through the Rilda Canyon in a southwesterly direction. Near the fork between the Right (north) and Left (south) Forks of Rilda Canyon, the county road terminates at a turn-around, and a mine road continues up the Left Fork behind a locked gate. The mine road is closed to public vehicular traffic and is used solely by the mine for access to the South Fork Breakout on a limited basis.

C. GEOLOGY/MINERALS

Rilda Canyon is a tributary canyon to Huntington Canyon which is located on the Wasatch Plateau physiographic area. The Cretaceous Castlegate Sandstone is one of the upper members of the Mesa Verde Group and is the dominant cliff forming rock in the Rilda Canyon vicinity which forms the escarpment area where subsidence induced rockfalls would originate. It overlies the Blackhawk Formation which contains the coal beds which would be mined under the proposal. The Castlegate Sandstone ranges from 100 feet to 210 feet in thickness in the Rilda Canyon setting.

Federal Coal Leases U-024317, U-2810, SL-051221, and U-06039 are included within the northern portion of the permit area for the Deer Creek Mine. It is currently owned and operated by PacifiCorp and its subsidiary company, Energy West. Underground mining facilities within the identified leases include main entries for access within the Deer Creek Mine. There are surface facilities located in the Left Fork of Rilda Canyon, including a breakout (portal), fan, and substation. Additionally a power line was built in 1995 to support the surface facilities. Subsidence and hydrologic monitoring are being conducted under the MRP. These documents are contained in the Forest Service Project Records and can be referred to for additional information.

INCORPORATED
COB
UTAH DIVISION OIL, GAS AND MINING

Historically, the Leroy Mine, Rominger Mine, and Helco Mine operated in Rilda Canyon in the west half of Section 28. These mines were closed and reclaimed under the State of Utah, Abandoned Mine Land Reclamation programs in 1988.

Recoverable coal quantities are estimated at 23,255,979 tons in the entire project area, considering both seams are longwall mined. Mining of the two seams and expected timing are illustrated in the table below. This table assumes that full support room & pillar mining would not be economic, even though already approved in the current MRP and R2P2 (Chuck Semborski, personal communication, June 9th, 1999; George Tetreault, personal communication, July 14, 1999).

Mining Table

Seam	Recoverable Tons	Estimated Timing / Minelife
Blind Canyon		
4 Northern Panels	8,606,879	April 1999-August 2001
2 Southern Panels	3,657,598	August 2001-September 2002
Hiawatha		
4 Northern Panels	7,429,759	September 2002-October 2004
2 Southern Panels	3,561,743	October 2004-September 2005
Total	23,255,979	Area would be mined out by September 2005 if fully mined as proposed

D. WATER RESOURCES

The project area lies on a ridge dropping off of East Mountain southeasterly toward Huntington Canyon. There are perennial streams in both Rilda and Mill Fork Canyons, and scattered springs and seeps along the ridge in between. There is only a single known seep that lies on the ridge, *within the project area*. This seep does not produce enough water to warrant development for any type of use.

The North Emery Water Users Association (NEWUA) has, under Special Use Permit, a spring development for culinary water in the west 1/2 of Section 28 in the bottom of Rilda Canyon. The development including meters, valves and collection boxes is fenced to keep livestock and wildlife out of the development area. It is shown on the map in between the Leroy and Helco Mines. Additionally, a pipeline parallels the Rilda Canyon road, carrying water down-canyon from this source.

The springs are fed by the alluvial system in Rilda Creek and the majority of their recharge is from springs at the head of Rilda Canyon, west of the project area. A north-south fracture system is also thought to partially feed the NEWUA springs.

RECEIVED
EFFECTIVE: 008
UTAH DIVISION OIL, GAS AND MINING

E. WILDLIFE RESOURCES

Elk and Deer

The elk herd on East Mountain utilizes Rilda Canyon, Mill Fork Canyon and the ridge in-between as transitional range. The lower regions below the project area to Huntington Canyon provide winter range. The deer found in the project area are also part of a greater Manti herd. Deer found here are not as prevalent as the elk. Deer and elk inhabiting the project area are very important ecologically and economically. The Manti-La Sal National Forest designates deer and elk as Management Indicator Species (MIS). MIS is defined as a select group of species which can indicate change in habitat resulting from activities on the Forest (Forest Plan, p. II-31).

The project area is a moderately popular hunting site. Deer and elk within the project area provide hunting and viewing opportunities for many recreationists from around the State of Utah, similar to neighboring canyons and other areas on the forest.

Within the project area, deer and elk habitat is probably most influenced by the existence of roads which results in high human use and disturbance. Where not associated with roads, the project area contains the basic habitat elements needed by deer and elk for survival. Elk tend to avoid areas adjacent to roads having vehicle traffic, and spend more time in areas of dense cover above the forks or on the ridge between Mill Fork and Rilda Canyons.

Raptors

Raptor surveys are conducted annually as part of the Deer Creek Mine Mining and Reclamation Plan. The first surveys were conducted in 1981 and 1982, and they have been conducted annually since 1986. The most recent survey was conducted in 1998. No raptor nests were found in the area directly associated with the North Rilda lease area (project area) in the recent surveys. The surveys from the early 1980's indicated 2 golden eagle nests within the project area which can no longer be found.

Forest Service Sensitive Species

Regulatory Framework

Although not required under the Endangered Species Act, it is Forest Service policy to analyze potential impacts to Proposed and Sensitive Species (Forest Service Manual (FSM) 2670.31-32). Proposed species are those that are proposed by the US Fish and Wildlife Service to be listed as Threatened or Endangered. Sensitive Species are those identified by the Forest Service Regional Forester as, "those species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density" or "significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (FSM 2670.5).

Plant Species

A Biological Evaluation for Sensitive species is located in the Project Record. There are seven sensitive plant species known or suspected to occur on the Manti Division (Ferron/Price and Sanpete Ranger Districts). Those species include: Creutzfeldt-flower (Cryptantha creutzfeldii), Carrington Daisy (Erigeron carringtoniae), Canyon sweetvetch (Hedysarum occidentale var. canone), Link Trail Columbine (Aquilegia flavescens var. rubicunda), Musineal Groundsel (Senecio musinensis), Maguire Campion (Silene

INCORPORATED
COB
UTAH DIVISION OIL, GAS AND MINING

petersonii), and Arizona Willow (Salix arizonica). Details concerning these species, their habitat preferences, and occurrences are described below.

Locations and General Habitat for the Sensitive Plant Species Occurring in the Ferron/Price Ranger District

District	Listed Species	Location and Habitat
Ferron/Price	**Creutzfeldt flower**	Open Mancos Shale hillside and lower slopes in dry wash and Lower Muddy Creek drainages. Elevation 5500 to 6000 ft. Pinyon, Juniper mixed Mtn. brush veg. type. Some habitat occurs in the Upper Miller Creek drainage.
Ferron/Price	**Carrington Daisy**	Small isolated populations have been found mostly on Flagstaff limestone outcrops, at the head of Cove Creek top of East Mtn., south Rim of Heliotrope Mtn., and top of Ferron Mtn. Wind blown ridge top and snow drift sites. Elevation 9,000 to 11,000 ft. Low forb vegetation type.
Ferron/Price	**Canyon sweetvetch**	Scattered populations occur in lower Huntington Canyon, Straight Canyon, and near Joe's Valley. Plants are usually found on sites with a high water table, near springs or along stream beds. Riparian site in Pinyon/Juniper type. River Birch and Squaw bush are plants most commonly associated with this species. Elevation 5500 to 7000 ft.
Ferron/Price	**Link Trail Columbine**	"Link Canyon Columbine". This plant occurs in seeps and wet sites. Populations found in Link Canyon, Box Canyon, Muddy Creek drainage, Straight Canyon, and Joes Valley.
Ferron/Price & Sanpete	**Musineal Groundsel**	The Musinea Groundsel preferred habitat is rock talus and slide rock sites near snow drifts in Flagstaff Limestone formation. Population sites located on White Mountain, Heliotrope Mtn., High Top and Camel Rock, head of 12-Mile Canyon.
Ferron/Price & Sanpete	**Maguire Campion**	Scattered populations found mostly on Flagstaff limestone formation outcrops on high elevation ridges and snowdrift sites. From Wagon Road Ridge south to the top of White Mtn., Wasatch Plateau, Manti-La Sal National Forest. There is also a small population on Mt. Baldy and Black Mtn. Plant is part of the sub-alpine low forb plant community.
Ferron/Price	**Arizona Willow**	Arizona Willow requires a specific habitat that occurs as narrow strips along perennials streams around meadows and is dominated by mesic graminoids and mesic forbs. Elevation 8,990 to 10,500 ft. One population has been found on the Manti-La Sal N.F., Upper Beaver Creek, Muddy Creek drainage.

There are no known Forest Service Sensitive plant species within the project area. Except for Canyon sweetvetch, there is no known habitat for Forest Service sensitive plant species within the project area. Canyon sweetvetch habitat is found at the base of the slopes where springs or seeps occur and along the streambed. Habitat for the other sensitive plant species is not existent.

Vertebrate Species

A Biological Evaluation for Sensitive species is located in the Project Record. There are five vertebrate sensitive species known or suspected to occur on the Manti Division: Spotted Bat (Euderma maculatum), Townsend's Big-eared Bat (Plecotus townsendii), Flammulated Owl (Otus flammeolus), Northern Goshawk (Accipiter gentilis), and Three-toed Woodpecker (Picoides tridactylus).

Spotted Bat Habitat - Spotted bats occur in scattered areas throughout Utah. They have been found in a variety of habitat types including open ponderosa pine, desert scrub, pinyon-juniper, and open pasture and hay fields. They roost alone in rock crevices high up on steep cliff faces. Cracks and crevices ranging in width from 0.8-2.2 inches in limestone or sandstone cliffs are critical roosting sites. There is some evidence that individuals show fidelity to roost sites. They are territorial and avoid each other while foraging. They are thought to migrate south for winter hibernation. Spotted bats are rare and may

INCORPORATED
EFFECTIVE:
COB
UTAH DIVISION OIL, GAS AND MINING

be limited by suitable roosting sites. They are found in relatively remote, undisturbed areas, suggesting that they may be sensitive to human disturbance. Little is known of the spotted bat's food habits, they are thought to feed mainly on moths. They forage alone, after dark, and avoid each other by listening to the echolocation calls of others. (Leonard and Fenton, 1983; Woodsworth et. al., 1981; Watkins, 1977)

In the summer of 1997, surveys conducted by Genwal Resources Incorporated detected spotted bats using habitats within Mill Fork Canyon, Crandall Canyon, Biddlecome Hollow, Tie Fork, Huntington Canyon, and Bear Creek Canyon. Foraging areas were located at relatively low elevation sites associated with riparian vegetation with Huntington Canyon. Specific individual roost sites were not located, general roosting areas were identified on the cliff faces/rock outcrops in Crandall and Mill Fork Canyons. Additional roosting areas were identified throughout the Huntington Canyon drainage among sizeable cliff faces (Johanson, Rogers and Sherwin, 1997). Known observations of spotted bats on the Wasatch Plateau have been made at Joes Valley Reservoir and at Emerald Lake.

Spotted bat foraging and roosting habitat can be found throughout the Wasatch Plateau, mainly associated with riparian areas and steep rock/cliff outcrops. Evidence of bats, the species is unknown, was observed in the project area in the form of bat guano at isolated locations along the rock escarpment. Any spotted bats present would primarily use the escarpment for roosting and adjacent riparian area for foraging purposes.

Townsend's Big-Eared Bat (Western Big-Eared Bat) Habitat - Townsend's or Western Big-eared bats use a variety of scrub and forested habitats, throughout western North America. These bats use juniper/pine forest, shrub/steppe grasslands, deciduous forests and mixed coniferous forests from sea level to 10,000 feet elevation. They utilize colonial nurseries. Cool places such as caves, rock fissures, mines, and buildings are used for roosting and hibernation. Foraging on primarily moths is often done in open woodlands, along forest edges, and over water.

The Townsend's Big-eared bat occurs throughout western North America including Utah. During the winter they roost singly or in small clusters. They remain at these sites from October to February. Migration for these bats usually means a change in location in the same cave or to another nearby cave. The Townsend's Big-eared bat is very sensitive to human disturbance. It will readily abandon roosts when disturbed. (Kunz an Martin, 1982; Utah Division of Wildlife Resources, 1980).

In the summer of 1997, bat surveys were conducted by Genwal Resources Incorporated in areas within Huntington Canyon (Crandall Canyon, Biddlecome Hollow, Tie Fork, Huntington Canyon, Mill Fork, and Bear Creek Canyon). No Townsend's Big-eared bats were located in those areas.

In 1992, Townsend's Big-eared bats were found using inactive coal mines as hibernacula on the Ferron/Price Ranger District. They have also been found roosting in buildings of the Ferron/Price Ranger District in the town of Ferron during late summer of 1992.

Townsend's Big-eared bat foraging and roosting habitat can be found throughout the Wasatch Plateau, mainly associated with riparian areas and steep rock/cliff outcrops. Evidence of bats, the species is unknown, was observed in the project area in the form of bat guano at isolated locations along the rock escarpment. Any Townsend's Big-eared bats present would primarily use the adjacent riparian area for foraging purposes.

INCORPORATED
EFFECTIVE
UTAH DIVISION OIL, GAS AND MINING

Flammulated Owl Habitat - Flammulated owls are found throughout the western United States including Utah. They can be found in the mixed pine forests, from pine mixed with oak and pinyon at lower elevations to pine mixed with spruce and fir at higher elevations. They have also been found in aspen and second growth ponderosa pine, however, they prefer mature Ponderosa Pine-Douglas fir forests with open canopies. Large diameter dead trees with cavities are important nest site characteristics. They avoid foraging in young dense stands where hunting is difficult. Flammulated owls are dependant upon mature conifer stands for nesting. They are also known to avoid cut-over areas. Flammulated owls are almost exclusively insectivorous, preying on small to medium sized moths, beetles, caterpillars, and crickets (Reynolds and Linkhart, 1987; Johnsgard, 1988; Bull et. al., 1990).

Flammulated owls have been found in the Quitchupah drainage and the head of the Muddy Drainage on the Ferron/Price Ranger District. All but one of these locations have been associated with ponderosa pine.

Northern Goshawk Habitat - In nesting or foraging, the goshawk is a raptor of the dense forest. Goshawks have been found in a variety of forest ecosystems including lodgepole pine, ponderosa pine, Douglas-fir, mixed forest throughout much of the Northern hemisphere. They prey upon small mammals and birds (rabbits, squirrels, chipmunks, grouse, woodpeckers, jays, robins, grosebeaks, etc.). Goshawk nest sites are usually located in mature forests near water, and on benches of relatively little slope. Nests are often used year after year. Goshawks are very protective of their young in the nest and loudly defend them to intruders. They are very sensitive to human disturbance and have abandoned nests and young due to human activities that take place too close to their nest (Kennedy and Stahlecker, 1989; Hennessey, 1978).

The goshawk is a summer resident of the Wasatch Plateau and the number of nesting birds vary year to year. Nest sites are associated with aspen/mixed conifer, mixed conifer forest types. Habitat for the goshawk is marginal since the area of impact is mostly pinyon-juniper which doesn't provide good foraging or nesting areas.

Three-Toed Woodpecker Habitat - Three-toed woodpeckers range across North America. They are found in northern coniferous and mixed forest types up to 9000 feet elevation. Forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine are used by Three-toed woodpeckers for foraging and nesting. Nests may be found in spruce, tamarack, pine cedar, and aspen trees. Three-toed woodpeckers forage mainly in dead trees, although they will feed in live trees. About 75% of their diet is wood-boring beetle larvae, but they also eat moth larvae. They are major predators of the spruce bark beetle, especially during epidemics. Fire or insect-killed trees are major foraging areas. Forest fires and areas of insect outbreaks may lead to local increases in woodpecker numbers after 3-5 years (Bull et. al., 1986; Scott et. al., 1980).

Surveys for three-toed woodpeckers took place in suitable habitat on the Wasatch Plateau in June and July of 1992. Further surveys during the 1993, 1994, 1995, and 1996 field seasons on the Plateau resulted in additional three-toed woodpecker findings. This species was found on all Ranger Districts surveyed. Three-toed woodpeckers habitat is marginal in the area of impact is mostly pinyon-juniper. The presence of tree mortality from insects is limited to isolated trees rather than the epidemic that is found in other areas of the forest.

* References cited for sensitive species can be found in the Biological Evaluation prepared for this project (Project Record).

INCORPORATED
FEB 1 1996
UTAH DIVISION OIL, GAS AND MINING

Federally Listed Proposed Species

There are no known US Fish and Wildlife Service Proposed plant or vertebrate species within the project area (US Fish and Wildlife Service list January 7, 1998).

Federally Listed Threatened And Endangered Species

Federal agencies are mandated to analyze effects of proposed projects on Threatened and Endangered species according to the Endangered Species Acts. A Biological Assessment for Threatened and Endangered species is located in the Project Record. Species potentially impacted by the project include:

Species	Classification
Bald Eagle (Haliaeetus leucocephalus)	Threatened
Peregrine Falcon (Falco peregrinus anatum)	Endangered
Colorado Squawfish (Ptychocheilus lucius)	Endangered
Bonytail Chub (Gila elegans)	Endangered
Humpback Chub (Gila cypha)	Endangered
Razorback Sucker (Xyrauchen texancus)	Endangered
Southwestern Willow Flycatcher (Empidonax traillii extimus)	Endangered

* The above species list were derived from a U.S. Fish and Wildlife Service (USFWS) list of threatened, endangered and proposed species that may be present in the general Wasatch Plateau area (List received 1998)

Bald Eagles Habitat

During the breeding season bald eagles are closely associated with water, along coasts, lake shores, or river banks. 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. These communal roosts are located in forested stands that provide protection from harsh weather.

Bald eagles can often be found near lakes and reservoirs as well as upland areas on the Manti Division during the late fall and early winter. When lakes and reservoirs freeze over most eagles will leave, however, those feeding in upland areas may stay late into the winter. A pair of nesting bald eagles has recently been located ten miles east of the Forest boundary near the town of Castle Dale. In 1994, a review of the nesting adults and fledglings indicated their foraging habits were within five mile radius from the nest tree. The eagles were not observed inhabiting the analysis area (Boshen, 1995). No bald eagles are known to nest on the forest.

Peregrine Falcon Habitat

Peregrines occupy a wide range of habitats. They are typically found in open country near rivers, marshes, and coasts. Cliffs are preferred nesting sites, although peregrines now regularly nest on man-made structures such as towers and high-rise buildings. Peregrines are known to travel more than 18

INCORPORATED
COB
UTAH DIVISION OIL, GAS AND MINING

miles from the nest site to hunt for food. However, a 10 mile radius around the nest is an average hunting area, with 80 percent of the foraging occurring within a mile of the nest. Peregrines prey on wide variety of birds including shorebirds, waterfowl, grouse, and pigeons (Ratcliffe 1980; and Cade et al. 1988). Migrating or transient peregrines have been seen on the Wasatch Plateau, including Joes Valley.

On April 10, 1996 a helicopter survey conducted by the Utah Division of Wildlife Resources in cooperation with the PacifiCorp, Bureau of Land Management (BLM) and U.S. Forest Service (USFS) found a pair of falcons. The falcons have been observed several times since then from the ground. This is an expansion of the falcon into a new breeding territory and the first observation of breeding falcons in the Manti Division. The falcons have been observed showing breeding behavior including; copulating, driving golden eagles from the area, and exploration of ledges for egg laying. This pair is located approximately 10 miles south of the project area. A peregrine falcon has been seen in the project area, the bird probably uses the general area for foraging but no nesting sites are known to occur in the project area. Annual raptor flights will be done in conjunction with PacifiCorp and the UDWR.

Colorado Squawfish Habitat

The Colorado squawfish had a historic range from Green River, Wyoming, to the Gulf of California, but the species is now confined to the upper Colorado River Basin mainstream and larger tributaries (USFWS 1987a). The lower Green River between the Price and San Rafael rivers contains abundant Colorado Squawfish (USFWS 1987b). In general, the species decline can be attributed to direct loss of habitat, changes in water flow and temperature, blockage of migrations, and interactions with introduced fish species (USFWS 1987b). Colorado squawfish adults are thought to prefer deep water eddies and pools or other areas adjacent to the main water current, whereas the young inhabit shallow, quiet backwaters adjacent to high flow areas. Colorado squawfish feed on invertebrates while young but gradually move to preying on other fish after one year (Woodling 1985). No Colorado squawfish have been located on the Forest but they are present in the drainages that receive water originating on the Forest.

Bonytail Chub Habitat

Historically bonytail chubs existed throughout the Colorado River drainage (Woodling 1985). Recently, isolated captures of bonytail chubs have been made in the Colorado River basin but recruitment to the population is extremely low or nonexistent. The decline of the bonytail chub is attributed to dam construction and associated water temperature changes. Other factors contributing to the reduced numbers include flow depletion, hybridization, stream alterations associated with dam construction, and the introduction of non-native fish species. The bonytail chub generally inhabits eddies and pools over swift current areas (Woodling 1985). The chub is an omnivore, feeding mostly on terrestrial insects, plant debris and algae and begins to spawn at five to seven years of age (Behnke and Benson 1980).

No bonytail chubs have been located on the forest but they are present in drainages that receive water originating on the Forest.

INCORPORATED
EFFECTIVE
UTAH DIVISION OIL, GAS AND MINING

Humpback Chub Habitat

The humpback chub is believed to have inhabited all of the large rivers of the upper Colorado River basin and canyons of the lower Colorado River basin (Ono, Williams, and Wagner 1983). Presently the humpback chub can be located in and above the Grand Canyon, Arizona, and the major tributaries to the Colorado River (Woodling 1985) The USFWS (1990) cites stream alteration, including dewatering, and dams and channelization, as factors causing the decline of the species. The humpback chub normally lives adjacent to high velocity flows, where they consume plankton and small invertebrates (USFWS 1990). The humpback chub has not been located on the Forest but they are present in drainages that receive water originating on the Forest.

Razorback Sucker Habitat

Historic distribution of the razorback sucker was mainly along the mainstream of the Colorado, Green and San Juan Rivers. They presently only occur in a portion of their former range in these rivers and are normally found in water four to ten feet deep within areas of strong currents and backwaters (Woodling 1985). Spawning fish have been located over both sand and gravel/cobble bars (USFWS 1987b). The razor back sucker feeds on small invertebrates, and animals and organic debris on the river bottoms. Behnke and Benson (1980) link the decline of the razorback sucker to the land and water uses, particularly dam construction and the associated change of flow regimes and river channel characteristics. The razorback sucker has not been located on the Forest but they are present in drainages that receive water originating on the Forest.

Southwestern Willow Flycatcher Habitat

The Southwestern willow flycatcher (SWWF) spends most of its time in the southwestern United States and may be extending its range to the lower one/fourth of the state of Utah. These flycatchers are closely associated with riparian habitats, on the shores of ponds, or bordering marshy areas. They are also found in the brushy margins of fields, along mountain streams, and in shrubby floodplain areas. They prefer areas of high shrub densities interspersed with openings or meadows. The woody component of their habitat is almost exclusively deciduous including willows, alders, cottonwoods, aspens, and shrubs such as chokecherry, hawthorn, sumac and wild rose. As the name implies Southwestern Willow Flycatchers are insectivores eating wasps, bees, beetles, flies, moths and butterflies (Unitt 1987). Willow flycatchers have been found on the Wasatch Plateau, however at the present time it is uncertain if they are SWWF or Northern Flycatchers. Riparian vegetation is present in proximity to the project area but will not be affected by the operation.

* References cited for Threatened or Endangered species can be found in the Biological Assessment prepared for this project (Project Record).

INCORPORATED
EXHIBIT
COB
UTAH DIVISION OIL, GAS AND MINING

F. RECREATIONAL OPPORTUNITIES AND USE

Current Opportunities and Use

The project area has only one primary road up Rilda Canyon, which terminates near the forks of the canyon in Section 29. A mine road continues up the Left Fork to the surface facilities and a former drill road, now converted to a trail (Trail No. 395), continues up the Right Fork approximately 1.5 miles. This trail does not connect to a trail system, and is considered a "dead-end" trail. Both trail and road are used lightly during the summer and early autumn months . Light use of undeveloped campsites along Rilda Creek/Rilda Canyon Road is experienced during the summer months.

Visual Quality

The characteristic landform of this area is steep narrow canyons of major escarpments. Flowing parallel to the Rilda Canyon Road is Rilda Creek which has entrenched this particular canyon. This perennial stream is bordered by a narrow riparian corridor interspersed with cottonwoods. Thin rocky soils and a relatively arid climate have resulted in an open, primarily pinyon-juniper community established mostly on the less steep slopes above the creek. These coarsely textured/vegetated slopes end abruptly at the base of the dominating Castlegate Sandstone outcrop. Soil colors are light brown to tan, consistent with this eroding parent sandstone material above.

The Forest Plan has assigned a Visual Quality Objective to each area of the Forest reflecting the desired management emphasis of the specific area. Some of those objectives assigned allow a noticeable degree of change. This flexibility was incorporated into the Forest Plan to facilitate Forest management goals.

The term Visual Quality Objective refers to the degree of acceptable visual alteration of the landscape and may be defined as follows: A desired level of scenic excellence based on physical and sociological characteristics of an area. Typically, more stringent VQO's are incorporated to protect the most highly visible and most frequently seen areas that have the greatest amount of variety in vegetation and other features which occur naturally.

After comparing the specific limits of the project area with the Forest Plan visual quality map, it was determined that any area of potential visual impact has been designated as Modification, on Forest Service lands.

Under the VQO of Modification, management activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures and roads must remain visually subordinate to the proposed composition. Reduction in form, line, color, and texture should generally be accomplished in the first year. In summary; this broad objective allows for most forms of management activity including those which are visually obtrusive, however the activity (especially associated roads and structures) must be designed to fit the context of the natural surroundings.

INCORPORATED
EFFECTIVE
008
UTAH DIVISION OIL, GAS AND MINING

G. RANGELAND USE

The project area falls within the Gentry Cattle and Horse Allotment (canyon bottoms) and the Crandall Ridge Sheep and Goat Allotment (ridge between Mill Fork and Rilda Canyons).

As a result of the upgrading of the Rilda Canyon Road by Emery County to the forks and the construction of the Deer Creek Mine surface facility, wildlife mitigation lead to installation of a cattleguard and fence, precluding the grazing use of that portion of Rilda Canyon above the springs in the northwest 1/4 of section Little range use is experienced from the mouth of the canyon up to the cattle guard and fence, primarily only during the period that the Gentry Allotment cattle are being moved onto and off from the forest.

The Crandall Ridge Sheep and Goat Allotment typically has 1032 sheep that graze the allotment overall. Few if any sheep are pushed out to the end of the ridge between Rilda and Mill Fork Canyons above the project area. These few sheep spend only 1 to 2 days there due to the lack of water and difficult access.

H. CULTURAL RESOURCES

An archeological reconnaissance of escarpment areas was conducted in 1997. Several areas were identified as having some potential to contain cultural resources. Subsequent, intensive archeological survey of the areas did not locate any archeological/historical sites. Based on these data it was determined that the project should have no effect on historic properties. Consultation was done with the State Historic Preservation Office (SHPO) and concurrence with the "no effect" finding was made (Project Record).

I. SOCIO-ECONOMICS

The Deer Creek Mine currently directly employs 263 people and contributes to jobs in related support industries in the surrounding communities and states. The mine provides coal for the Huntington Power plant which in turn supplies electricity for PacifiCorp's power grid. Lastly, the coal mined on the federal leases generates royalties for the US Treasury, which are further distributed to State and Local governments.

INCORPORATED
DIRECTOR CAB
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 4
Environmental Consequences

A. INTRODUCTION

This chapter identifies the projected impacts from implementing the no action and the action alternative considered in detail, presented in Chapter 1. This chapter discloses both the potential direct/indirect effects and cumulative impacts. Direct/indirect effects are those effects that would likely occur during or shortly after implementation of a specific alternative. Direct/indirect effects are presented by resource topic corresponding to the issues identified in Chapter 2. Cumulative impacts are those effects which may occur with implementation of an alternative combined with other past, present, or reasonably foreseeable actions.

The effects of the mining operation were assessed in the Environmental Assessments for Federal Coal Leases U-024317, U-2810, SL-051221, and U-06039, and any subsequent readjustments. These documents discuss the existing and potential effects from surface facilities and mining induced subsidence. These analyses were done assuming conventional, room and pillar mining operations under the escarpments however. No subsidence of the escarpment was to be authorized without additional analysis, as stipulated in the lease. Mining operations were permitted and are regulated under the Utah Coal Rules and associated Federal and State regulations and programs. Facilities have been designed and constructed in accordance with required standards. Below, each alternative is analyzed relative to the elements developed from the issues for this environmental assessment.

B. DIRECT & INDIRECT EFFECTS OF ALTERNATIVE IMPLEMENTATION

RESPONSIVENESS TO PURPOSE & NEED:

Alternative 1

Approximately 16,036,638 would be mined from the previously permitted northern four panels in both Blind Canyon and Hiawatha Seams. About 7,219,341 tons of potentially recoverable coal reserves in the southern two panels of each seam would not be recovered due to surface resource concerns. By not being permitted to mine the two seams of the two southern panels, the life of the mine would be shortened by 2 years overall (ending about September 2003 rather than September 2005). Full support room & pillar mining of the 2 southern panels in each seam would not be economic, even though already approved in the current MRP and R2P2 (Chuck Semborski, personal communication, June 9th, 1999; George Tetreault, BLM, July 14, 1999).

Alternative 2

Approximately 23,255,979 tons of recoverable coal would be mined, and the life of the mine would be extended by 2 years, with operations finishing up in September 2005.

ISSUES:

INCORPORATED
UTAH DIVISION OIL, GAS AND MINING

Rockfalls:

Alternative 1

Under the "no Action" alternative, the Forest Service would not consent to the amendment of the R2P2 and the subsequent mine plan modification and the subsequent permits would not be amended as proposed by the responsible agencies. Mining induced subsidence would not be permitted and therefore there would be no mining induced failure. Natural rockslides would continue to occur at a slow rate; continually modifying the scenery (visual quality), altering vegetation, contributing to sedimentation and potentially creating hazardous conditions for public users.

Alternative 2

Under the action alternative, the Forest Service would consent to the amendment of the R2P2 and the subsequent mine plan modification. Mining induced subsidence would be permitted and mining induced failure of parts of the escarpment would be expected. Natural rockslides would also continue to occur.

An analysis conducted by Maleki Technologies Inc. studied the Castlegate Escarpment in the project area and divided the approximately 11,000 feet of exposure into 110 cells and through data collection and modeling, established a risk of failure for each cell; low, moderate and high. Of the 110 cells analyzed (each approximately 100 feet long), 11 were shown to have a low potential of failure due to mining induced subsidence. Moderate potential of failure was assigned to 23 of the cells, and a high potential of failure was assigned to 76 cells, or about 69% of the total escarpment length in the project area.

These rockfalls, as seen from within Rilda Canyon, would appear similar to naturally occurring rockfalls in the vicinity, except that the linear scale would be substantially greater. As noted above, 69% of the escarpment, or approximately 7,600 feet, falls in the "high potential of failure" category. It is expected that much of that 7,600 feet of escarpment would experience some degree of rock falls or rockslides, forming fresh-looking rock faces and talus slopes.

The Maleki study predicted the potential for failure based on data collected at Newberry Canyon, Cottonwood Canyon (Trail Mountain Mine), and the geology in Rilda Canyon, including comparison of joint patterns and direction of mine panel orientation. The Maleki study suggested that the areas most susceptible to failure were concave portions of the escarpment. Prominences, jutting outward into the canyons, were not as likely to fail, or at least not to the same degree.

Escarpment failure could visually affect lands within the reaches of upper Rilda Canyon. This potential visual effect is predicted to be consistent with other common naturally occurring failures viewed throughout this and all other similarly formed canyons. Accordingly, noticeable visual effect to the casual Forest visitor will fall well within the parameters outlined for the VQO of Modification.

The project area lies out of sight of Highway 31, being located approximately 2 miles up Rilda Canyon. The visual effect of escarpment failure on the public at large is anticipated to be negligible.

The Colorado Rockfall Simulation Program (CRSP) and the support data provided by PacifiCorp does not show any rockfall reaching the Rilda Canyon Road. The proposal commits to the installation of warning signs to further minimize any risk to safety.

INCORPORATED
EFFECTIVE
CCB
UTAH DIVISION OIL, GAS AND MINING

The CRSP was originally calibrated in PacifiCorp's analysis to a failure in similar geology and terrain in nearby Newberry Canyon, associated with their Cottonwood-Wilberg Mine complex. As part of their analysis, they observed the material of the Castlegate Sandstone that had failed and then modeled it to see what size material might be expected to fail in the subject mine plan amendment area.

Later the model was applied to the Trail Mountain Mine, mining of 4th and 5th east longwall panels, also undermining the Castlegate Sandstone, in a similar geologic terrain. The model proved to be accurate.

Given the low recreational use of this canyon, the results of the CRSP, and the voluntary proposal by the Deer Creek Mine to place signs warning of potential rockfall hazards along the Rilda Canyon road, there is negligible threat to public safety anticipated.

The Deer Creek Mine will also monitor subsidence through their mine plan requirements and as proposed, provide higher resolution monitoring data for the north slope of Rilda Canyon by installing prisms for accurate surveying on the top of the escarpments.

There is potential for temporary loss of vegetation on the sparsely vegetated slopes of Rilda Canyon due to rockfalls and slides, and a minimal increase in sediment production. The rock exposure on the north slope and naturally occurring sedimentation is already present. The failure of escarpment would merely accelerate the process, until revegetated.

COMPARISON OF DIRECT EFFECTS

Disturbance	Alternative 1	Alternative 2
Escarpment At Risk Of Failure Due To Mining		
High Risk	**0**	**7,600 feet**
Moderate Risk	**0**	**2,300 feet**
Low Risk	**0**	**1,100 feet**
Recoverable Tons of Coal	**16,036,638**	**23,255,979**
Life of Mine	**4 yrs, 5 mos.**	**6 yrs, 5 mos.**

Water Resources:

Alternative 1

Under the "No Action" alternative, the Forest Service would not consent to the amendment of the R2P2 and the subsequent mine plan modification. Mining induced subsidence would not be permitted and therefore there would be no mining induced failure.

The north-south fracture system thought to be partially feeding the NEWUA springs could be altered by full support mining authorized by the current MRP and R2P2.

Natural rockslides would continue to occur continually altering vegetation and contributing to erosion and sedimentation.

RECEIVED
DIVISION OF
OIL, GAS AND MINING
UTAH DIVISION OIL, GAS AND MINING

Alternative 2

As discussed in the Rockfalls section above, there is a high probability of escarpment failure, however, the CRSP results illustrate that rockfalls would not cause a safety hazard as far as the road. It follows that the potential for rocks and debris traveling further to threaten the spring development facilities and Rilda Creek is even less likely. However, accelerated erosion associated with the 7600 feet of rockfall/escarpment failure could increase sediment in the Rilda Canyon/Huntington Canyon drainages.

Any unforeseen damage to permitted facilities on National Forest System lands would be required to be repaired under the existing lease stipulations. Likewise, water loss (quality or quantity) would require replacement, and damages done to stream and riparian environments would also be repaired by the mine under their existing mining and reclamation plan.

The north-south fracture system thought to be partially feeding the NEWUA springs could be altered by full support mining authorized by the current MRP and R2P2 or by the action alternative allowing longwall mining and subsequent subsidence.

The seep on the ridge could be altered as a result of mining and subsidence leading to corresponding vegetation changes.

Wildlife Resources:

Alternative 1

Under the "No Action" alternative, the Forest Service would not consent to the amendment of the R2P2 and the subsequent mine plan modification. Mining induced subsidence would not be permitted and therefore there would be no mining induced failure affecting the wildlife resources.

Alternative 2

Elk and Deer

This alternative could temporarily increase animal stress, causing displacement, and in rare isolated instances mortality. In the short term, mining disturbance could displace localized individual deer and elk populations that tend to move through the area below the escarpment area, in the bottom of the valley.

Raptors

Mining-induced subsidence would be permitted and therefore potential for escarpment failure would be likely, potential nesting habitat would be lost for raptors. There are currently no nests on the Rilda Canyon escarpment proposed to be mined, though two old nest sites had been previously identified in the Deer Creek Mine Mining and Reclamation Plan. These nests are now abandoned/dilapidated or gone entirely. Raptor surveys are conducted annually as part of the Deer Creek Mine Mining and Reclamation Plan, PacifiCorp conducts a helicopter raptor survey with the Utah Division of Wildlife Resources as observers. The first surveys were conducted in 1981 and 1982, and they have been conducted annually since 1986. The most recent survey was conducted in 1998. No raptor nests were found in the area directly associated with the North Rilda lease area (project area).

RECEIVED
UTAH DIVISION OIL, GAS AND MINING

Raptors are known to reside in the vicinity of Rilda and Mill Fork Canyons. Though they have not been nesting in the project area, there are nests located on the south slope escarpments in Rilda Canyon, and elsewhere in the area. These individuals would continue undisturbed in the area under this alternative.

If a raptor moves into and nests upon escarpment in the project area, consultation with the Utah Division of Wildlife Resources will be initiated. If the raptor is a Threatened or Endangered species the US Fish and Wildlife Service (USFWS) will also be notified and consulted prior to proceeding with mining that would cause loss of the new nest(s).

Sensitive Species

Six sensitive species have been evaluated for potential impacts. The species are listed below with the impact potential.

SPOTTED BAT ***(Euderma maculatum)***

There is a potential impact to the spotted bat. The bats' roosting habitat is located on mountain side slopes in cracks and crevices in rock outcrops and escarpments. The area has a high potential of an escarpment failure that would remove some roosting habitat, and potentially result in the loss of individual bats. A past inventory (1997) conducted by Genwal Resources Incorporated detected spotted bats using habitats within Mill Fork Canyon, Crandall Canyon, Biddlecome Hollow, Tie Fork, Huntington Canyon, and Bear Creek Canyon (these areas are adjacent to Rilda Canyon). Foraging areas were located at relatively low elevation sites associated with riparian vegetation with Huntington Canyon. Spotted bat foraging and roosting habitat can be found throughout the Wasatch Plateau, mainly associated with riparian areas and steep rock/cliff outcrops. Roosting habitat associated with this project will be impacted if the escarpments fail due to the mining activity or natural rockslides. Evidence of bats, the species is unknown, was observed in the form of bat guano at isolated locations along the rock escarpment in Rilda Canyon. Any spotted bats present would primarily use the adjacent riparian area for foraging purposes.

TOWNSEND'S BIG-EARED BAT ***(Plecotus townsendii)***

There is a potential impact to the Townsend Big-eared bat. The bats roosting habitat is located on mountain side slopes in cracks and crevices in rock outcrops and escarpments, caves and buildings. The area has a high potential of an escarpment failure that would remove some roosting habitat, and potentially result in the loss of individual bats. A past inventory (1997) conducted by Genwal Resources Incorporated failed to detect any Townsend Big-eared bats. Surveys were done in Mill Fork Canyon, Crandall Canyon, Biddlecome Hollow, Tie Fork, Huntington Canyon, and Bear Creek Canyon (these areas are adjacent to Rilda Canyon). Roosting habitat associated with this project will be impacted if the escarpments fail due to the mining activity or natural rockslides. Evidence of bats, the species is unknown, was observed in the form of bat guano at isolated locations along the rock escarpment in Rilda Canyon. Any bats present would primarily use the adjacent riparian area for foraging purposes.

INCORPORATED
UTAH DIVISION OF OIL, GAS AND MINING

FLAMMULATED OWL *(Otus flammeolus)*

No flammulated owl surveys have been conducted within the project area, this area provides only marginally suitable habitat for this species. If flammulated owls exits here they are most likely at very low population levels. No direct or indirect effects are anticipated.

NORTHERN GOSHAWK *(Accipiter gentilis)*

Wildlife surveys have located several active goshawk nests on the Wasatch Plateau, however none were found in the project area. The project area contains primarily pinyon-juniper and does not provide the habitat preferred by the goshawk. No direct or indirect effects are anticipated to this species.

THREE-TOED WOODPECKER *(Picoides tridactylus)*

If Three-toed woodpeckers exist here they are most likely at very low population levels. The project area contains primarily pinyon-juniper and does not provide the habitat preferred by the Three-toed woodpeckers. No direct or indirect effects are anticipated.

CANYON SWEETVETCH *(Hedysarum occidentale var. canone)*

Habitat is found at the base of the slopes where springs or seeps are found and along the streambed. The bottom of the canyon where the habitat exists is not proposed to be subsided. This species was seeded in the potential habitat but the species did not persist. The plant will not be affected by this action.

SUMMARY OF EFFECTS FOR SENSITIVE SPECIES

SPECIES	ALT 1	ALT 2
Spotted bat	No Impact	MIIH
Townsend's big-eared bat	No Impact	MIIH
Flammulated owl	No Impact	No Impact
Northern Goshawk	No Impact	No Impact
Three-toed woodpecker	No Impact	No Impact
Canyon Sweetvetch	No Impact	No Impact

MIIH = May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species.

INCORPORATED
EFFECTIVE
CAB
UTAH DIVISION OIL, GAS AND MINING

Threatened & Endangered Species

Suitable Habitat

The area affected by the proposed action does not contain suitable habitat (i.e. elevation, vegetation, and/or geology) and known home ranges for many of the Threatened or Endangered species. Therefore, it is determined that there will be no effect upon them. These species (as listed below) are therefore eliminated from further analysis.

* Colorado Squawfish (**Ptychocheilus lucius**) - The endangered fish species of the Colorado River occur in waterways more than 100 miles away from the proposed action. The proposed action is not expected to cause any measurable changes in sediment yields or water flow into the Colorado River Drainage.

* Bonytail Chub (**Gila elegans**) - The endangered fish species of the Colorado River occur in waterways more than 100 miles away from the proposed action. The proposed action is not expected to cause any measurable changes in sediment yields or water flow into the Colorado River Drainage.

* Humpback Chub (**Gila cypha**) - The endangered fish species of the Colorado River occur in waterways more than 100 miles away from the proposed action. The proposed action is not expected to cause any measurable changes in sediment yields or water flow into the Colorado River Drainage.

* Razorback Sucker (**Xyrauchen texancus**) - The endangered fish species of the Colorado River occur in waterways more than 100 miles away from the proposed action. The proposed action is not expected to cause any measurable changes in sediment yields or water flow into the Colorado River Drainage.

The potential for effects upon the following species will be analyzed further.
Bald Eagle (Haliaeetus leucocephalus), Peregrine falcon (Falco peregrinus anatum), Southwestern Willow Flycatcher (Empidonax traillii extimus).

Effects of the Project Proposal

Bald Eagles (**Haliaeetus leucocephalus**)

Bald Eagles can often be found near the lakes and reservoirs on the Manti Division during the late fall and early winter. Joes Valley Reservoir has been known to annually inhabit bald eagles from approximately mid October to early January. When the reservoir freezes over, the eagles leave. A pair of bald eagles have been known to nest near the town of Castle Dale (approximately 10 miles south of the proposed action). Reviews of the nesting eagles near Castle Dale indicate foraging habitat of adults and juveniles are within an approximate five mile radius from the nest site. The nesting eagles's home range was not identified to be within any of the area addressed in the Deer Creek Mine Plan Amendment. The project area has been surveyed by the U.S. Fish and Wildlife Service, Utah Division of Wildlife Resources, and local coal companies for the past thirteen years. Lately, follow-up surveys have been conducted yearly. A raptor nest was found a couple of years ago,

INCORPORATED
UTAH DIVISION OIL, GAS AND MINING

however during the 1998 survey this nest could not be relocated (nests on cliffs have the tendency to be blown away after time). No direct or indirect effects caused by the mine operation are expected. No bald eagles are known to inhabit the area outside of the wintering period.

The proposed action will not contribute to loss of viability for the following reasons:

1) Bald Eagles are known not to nest or reproduce within any of the proposed action areas.
2) No bald eagles are known to utilize any of the proposed project area.
3) Reviews of the nesting bald eagles near Castle Dale indicate foraging habits of adults and juveniles are not within the proposed action areas.

Peregrine Falcon (**Falco peregrinus anatum**)

Peregrines prefer cliffs as nest sites. Existing cliff faces occur within the effected area. The Manti Division underwent intense aerial surveys for peregrine falcons. The area was surveyed by the U.S. Fish and Wildlife Service, Utah Division of Wildlife Resources, and local coal companies approximately thirteen years ago. Lately follow-up surveys have been conducted yearly, a couple of years ago a confirmed sighting of a peregrine was made in Rilda Canyon, however the bird did not establish a scrape in the area. Habitat exists throughout the general area, however no birds are known to inhabit the area besides perhaps when foraging. No direct or indirect effects caused by the mine operation are expected.

The proposed action will not contribute to loss of viability of the peregrine falcon for the following reasons:

1) Peregrine falcons have recovered to a level of approximately 160 eyries in the state of Utah. Well above the 21 active eyries set as a goal for Utah by the American Peregrine Falcon Recovery Plan.
2) No peregrine falcons are known to utilize any of the proposed project area, except perhaps in general foraging.

Southwestern Willow Flycatcher (**Empidonax traillii extimus**)

Flycatchers are closely associated with riparian habitats such as willow or alder thickets along streams, on the shores of ponds, or bordering marshy areas. They are also found in the brushy margins of fields, along mountain streams, and in shrubby floodplain areas. Willow Flycatchers have been found on the Wasatch Plateau, however at the present time it is uncertain if they are SWWF or Northern Flycatchers. Riparian vegetation is present in proximity to the proposed coal extraction site but will not be affected by the operation, the coal company has proposed to place mains that would go under the streambed (at a right angle), but would not subside this area. The mining operation should not affect the streambed so this should not impact any flycatchers, if present.

The proposed action will not contribute to loss of viability of the Southwestern Willow Flycatcher for the following reasons:

1) Flycatchers are closely associated with riparian habitats, this habitat is present in proximity to the proposed coal extraction site but will not be affected by the operation.
2) Willow flycatchers have been found on the Wasatch Plateau, however at the present time it is uncertain if they are SWWF or Northern Flycatchers.

INCORPORATED
008
UTAH DIVISION OIL, GAS AND MINING

SUMMARY OF EFFECTS FOR LISTED SPECIES

SPECIES	ALT 1	ALT 2
Bald Eagle	No Effect	No Effect
Peregrine Falcon	No Effect	No Effect
Southwestern Willow flycatcher	No Effect	No Effect

Socio-Economics:

Alternative 1

Under the "No Action" alternative, the Forest Service would not consent to the amendment of the R2P2 and the subsequent mine plan modification and the subsequent permits would not be amended as proposed by the responsible agencies. Mining of the permitted area would be done in September of 2003, resulting in 263 miners potentially losing their jobs at that point in time.

Alternative 2

Under the action alternative, the Forest Service would consent to the amendment of the R2P2 and the subsequent mine plan modification. Longwall mining would be permitted in both seams for the 2 southern panels extending mine life to September of 2005. The Deer Creek Mine currently employs 263 miners who would potentially keep their jobs longer as the North Rilda area is mined out if the action alternative is selected. Additionally, the royalties returned to the US Treasury would be increased if the action alternative is selected as shown in Chapter 2 "Comparison Summary Of Alternatives".

C. CUMULATIVE IMPACTS

The cumulative impacts of past and present activities in combinations with each alternative are presented in the preceding section by issue topics

Alternative 1

Historically man's activities in the project area have included livestock grazing, recreational use, and coal production, which have resulted in changes in the topography, vegetation, and erosion. Cumulative effects resulting from mining coal could include the effects from subsidence and the human activity from continued operations as it exists on these leases and adjacent leases. PacifiCorp is monitoring the impacts of mining on the permit area as part of the Mining and Reclamation Plan. To date, the results of monitoring in the permit area indicate that no notable impacts to surface resources have occurred from mining. (Deer Creek Mine submits subsidence and hydrologic monitoring reports annually as a requirement of their MRP.) There would be no change in the existing condition.

Past and present fossil fuel exploration drilling and production within the surrounding area has and will remove minimal amounts of water and disturb relatively small to medium amounts of surface areas and

INCORPORATED
Utah Division Oil, Gas And Mining

vegetation habitat. In the past, impacts to sensitive species have been insignificant. In the reasonable foreseeable future, it is estimated that additional drill exploring and production of gas/coal is likely.

Other forest-use practices and natural events have affected wildlife habitat within the project area. Livestock grazing is one of the primary forest uses in the area. Livestock use has decreased foraging opportunities through competition and have altered vegetation of the habitat, although the previous work in Rilda Canyon has lead to mitigation, including the exclusion of livestock above the cattleguard at the North Emery Water Users Association spring development. Additionally, Rilda Creek was probably perennial below the forks prior to the NEWUA spring development.

Activity from hauling and recreational use in Rilda Canyon has increased in part due to the road improvements done on 1994 providing better access. The road construction (improvements) however have probably lead to an overall decrease in sedimentation to the creek.

Noise in the canyon has been increased due to the increased human presence, traffic on the road, and the construction of the portals and fans at Deer Creek Mine's Rilda Canyon Breakout facility located in the south fork.

Visual Quality in the canyon has been altered by the installation of the powerline to support the Rilda Canyon Breakout facility, as well as the facility itself.

Alternative 2

The cumulative impacts presented for Alternative 1 would persist with implementation of this alternative. Cumulative impacts from other resource activities (i.e. timber, grazing) are similar to those for Alternative 1.

Past and present fossil fuel exploration drilling and production within the surrounding area has and will remove minimal amounts of water and disturb relatively small to medium amounts of surface areas and vegetation habitat. In the past, impacts to sensitive species have been insignificant. In the reasonable foreseeable future, it is estimated that additional drill exploring and production of gas/coal is likely. Potential threats to wildlife foraging and nesting areas could exist, and continual mineral activity could decrease habitat. The mining company conducted a study to determine the likelihood of escarpment failure, the result of the study indicate that 69% of the escarpment is in the high potential for failure category. The longwall mining beneath the escarpment has the potential to remove a portion of the vertical rock face. Escarpments in this area are naturally falling however the mining would cause this process to be accelerated. Over time the escarpment should continue to erode and new ledges created. The failure of the escarpment would remove some cliff face and impact pinyon-juniper habitat. There would be no cumulative effects to any of the other Threatened or Endangered species. As a mitigation measure raptor activity should continue to be monitored to determine if any select the Rilda Canyon area as a nesting site. If bald or golden eagles, or peregrine falcons select the canyon as a nesting location then consultation with the US Fish and Wildlife Service and the Utah Division of Wildlife Resources will be initiated prior to proceeding with mining that would cause loss of the new nest(s).

Similar to the effects in Alternative 1, except that the magnitude of impacts could be increased. There will be an increase in erosion of the Castlegate Sandstone escarpment, primarily accelerated by the stresses placed on the rock by subsidence and associated rockfalls.

INCORPORATED

Utah Division Oil, Gas And Mining

CHAPTER 5
Personnel and Public Involvement

A. INTERDISCIPLINARY TEAM

Specialty	Resource Specialist	Role
NEPA/Geology	Jeffrey Wade DeFreest	Team Leader
Wildlife	Stan Anderson	Core Team
BLM/Economics	George Tetreault	Core Team
OSM	Floyd MacMullen	Extended IDT
Cultural Resources	Stan MacDonald	Extended IDT
Botany	Bob Thompson	Extended IDT
Landscape Architect	Kevin Draper	Extended IDT
NEPA	Reta Laford	NEPA Coordinator

B. PUBLIC INVOLVEMENT

Internal scoping for this project included review by various Forest Service resource specialists.

External scoping consisted of notice in the Forest's *Schedule of Proposed Actions*, Legal Notice published in the Sun Advocate (May 5th 1998), a News Release to the Sun Advocate from which an article was written about the project (May 5th, 1998), and by letter to a 18-person mailing list. Those individuals to whom letters were mailed included: Federal, State, and local governmental or land management entities; adjacent landowners and mining companies; range permittees; and others known to be potentially interested or affected. Three letters were received in response to external scoping. The entirety of these letters can be found in the project record.

INCORPORATED
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 6
References

Geological and Mining References:

Energy West/Deer Creek Mine Documents:

Deer Creek Mine, Mining & Reclamation Plan, 1992

Deer Creek Coal Mine North Rilda Area, January 1997

Status Report, June 1998, Rilda Canyon Escarpment Study

Status Report, February 1998, Assessment of Surface Impacts to the Castlegate Sandstone Escarpment from Full Extraction Reserve Recovery & Overview of Castlegate Sandstone Escarpment Geotechnical Model Evaluation.

East Mountain Cumulative Hydrologic Impact Assessment, July 1989 (9/94 update), Utah Division of Oil Gas and Mining.

Development of Preliminary Modeling Procedures for Assessing Castlegate Escarpment Stability, May 1998, Maleki Technologies Inc., Spokane Wa.

General and Forest References:

Manti-La Sal National Forest Plan and Final Environmental Impact Statement (1986)

San Rafael Resource Management Plan and Final Environmental Impact Statement (1992)

E/As prepared for Leasing & Readjustments of Federal Coal Leases: U-024317, U-2810, SL-051221, and U-06039

Biological References:

References used to determine the presence (or absence) of Threatened, Endangered, or Proposed Species as well as species characteristics and habitat information include:

Baxter, G.T. and J.R. Simon 1970 Wyoming fishes. Wyoming Came and Fish Dept. bull. No. 4. Cheyenne. 168 pp.

INCORPORATED
COB
Coal Division Oil, Gas And Mining

Behnke, R.J. and D.E. Benson. 1980. Endangered and threatened fishes of the upper Colorado River Basin Coop. Ext. Serv., Colorado State Univ. , Fort Collins, Bull. 503A. 34 pp.

Boschen. Nelson. 1995. Bald Eagles in Southeastern Utah: 1994 Nesting Season.

Cade, T.J., J.H. Enderson, C.G. Thelander, and C.M. White. 1988. Peregrine falcon populations: their management and recovery. The Peregrine Fund, Inc., Boise. 949 pp.

Daw, S.K. 1991. Preliminary Mexican Spotted Owl Survey in Glen Canyon National Recreation Area. Unpublished Technical Report.

Caney. J.L. 1988. Distribution and habitat ecology of Mexican spotted owls in Arizona. M.S. Thesis. Northern Arizona Univ., Flagstaff. 229 pp.

Johnsgard, P.A. 1988. North American owls, biology and natural history. Smith. Instit. Press, Washington and London. 295 pp.

Ratcliffe, D.A. 1980. The peregrine falcon. Buteo Books, Vermillion, SD. 416 pp.

Rocky Mt/Southwest Peregrine Falcon Recovery Team. 1984. American Peregrine Falcon Rocky Mountain/Southwest Population Recovery Plan. U.S Fish and Wildlife Service. 105 pp.

Sigler, W.F. and R.R. Miller. 1963. Fishes of Utah. Utah State Dept. of Fish and Game, Salt Lake City. 203 pp. Stalmaster, M.V. 1987. The bald eagle, Universe Books, New York. 227 pp.

Unitt, P. 1987. Empidonax traillii extimus: an endangered subspecies. Western Birds 18:137-162

Welsh, Stanley L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 1987. A Utah Flora. Great Basin Naturalist Memoirs Number 9. 894 pp.

Willey, D., J. Willey, and D. Chapman. 1991. Final Report - Mexican Spotted Owl Surveys in Forested Highlands and Adjacent Canyonlands in Southern Utah. Forest Service Contract Nos: 53-8462-0-07007, and 53-8462-0-07008. 57 pp.

A. Forest Service References

District wildlife observation records. USDA Forest Service, Price Ranger District, Price, Utah.

Personal communications with Forest Service personnel.

USDA Forest Service. 1991a. Threatened, Endangered, and Sensitive Species of the Intermountain Region. USDA Forest Service, Intermountain Region. Ogden, UT.

USDA Forest Service. 1991. Utah Endangered, Threatened, and Sensitive Plant Field Guide. USDA Forest Service, Intermountain Region, Ogden, Utah.

B. State Wildlife Agency References

INCORPORATED
EFFECTIVE
008
UTAH DIVISION OIL, GAS AND MINING

Personal communications with Bill Bates, Southeastern Regional Nongame Manager, Utah Division of Wildlife Resources, Price, UT.

Shirley D. Nongame Biologist Utah Division of Wildlife Resources. Personnel Communication with Rod Player, March 1991.

Utah Division of Wildlife Resources. 1980. Bats of Utah. UDWR Publication No.80-15.

Utah Division of Wildlife Resources. 1990. Fauna of Southeastern Utah and Life Requisites Regarding their Ecosystems. Publication No. 90-11.

C. U.S. Fish and Wildlife Service References

A phone call was made to the U.S. Fish and Wildlife Service (Susan Lanier) on April 10, 1995, relative to nesting Bald eagles near the town of Castle Dale.

Phone calls were made to the U.S. Fish and Wildlife Service to confirm the list of Threatened, Endangered, and Proposed Species.

U.S. Fish and Wildlife Service. 1995. Mexican Spotted Owl (Strix occidentalis lucida) recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 1995. Heliotrope milkvetch (Astragalus montii) recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. 11 pp. Federal Register Vol. 58 No. 140, 7/23/93.

References used to determine the presence (or absence) of Sensitive Species as well as species characteristics and habitat information include:

Bull, E.L., A.L. Wright, and M.G. Henjum. 1990. Nesting habitat of flammulated Owls in Oregon. J.Raptor Res. 24(3):52.55.

Bull, E.L., S.R. Peterson, and J.W. Thomas. 1986. Resource partitioning among woodpeckers in north-eastern Oregon. Res. Note PNW-444. LeGrande, OR: U.S. Dept. of Agricul., For. Serv., Pacific Northwest Res. Sta. 19 pp.

Hayward, G.D. 1989. Habitat use and population biology of boreal owls in the northern Rocky Mountains, U.S.A. Ph.D dissertation. Univ. of Idaho, Moscow. 113 pp.

Hennessey, S.P. 1978. Ecological relationships of accipiters in northern Utah with special emphasis on effects of human disturbance. M.S. Thesis, Utah State University, Logan, Utah. 65 pp.

Johnsgard, P.A. 1988. North American owls, biology and natural history. Smith. Instit. Press, Washington and London. 295 pp.

INCORPORATED
EFFECTIVE: 003
UTAH DIVISION OIL, GAS AND MINING

Kennedy. P.L., and D.W. Stahlecker. 1989. Preliminary Northern Goshawk Inventory. Unpublished Protocol.

Kunz, T.H. and RA. Martin. 1982. *Plecotus townsendii*. Mammalian Species No. 175. 6 pp.

Leonard, M.L. and M.B. Fenton. 1983. Habitat use by spotted bats *(Euderma maculatum)*, Chiroptera: Vespertilionidae: roosting and foraging behavior. Can. J. Aool. 61:1487-1491.

Reynolds, R.T. and B.D. Linkhart. 1987. The nesting biology of flammulated Owls in Colorado. Pages 239-248 in A.W. Nero, R.J. Clark, R.J. Knapton.

Scott, V.E., J.E. Whelan, and P.L. Svoboda. 1980. Cavity nesting birds and forest management. Pages 311-324 in R.M. DeGraaf, tech. coord. Proc. of workshop on management of western forests and grasslands for nongame birds. U.S. For. Serv. Gen. Tech. Rep. INT-86. Intermountain For. and Range Exp. Sta., Ogden, UT,

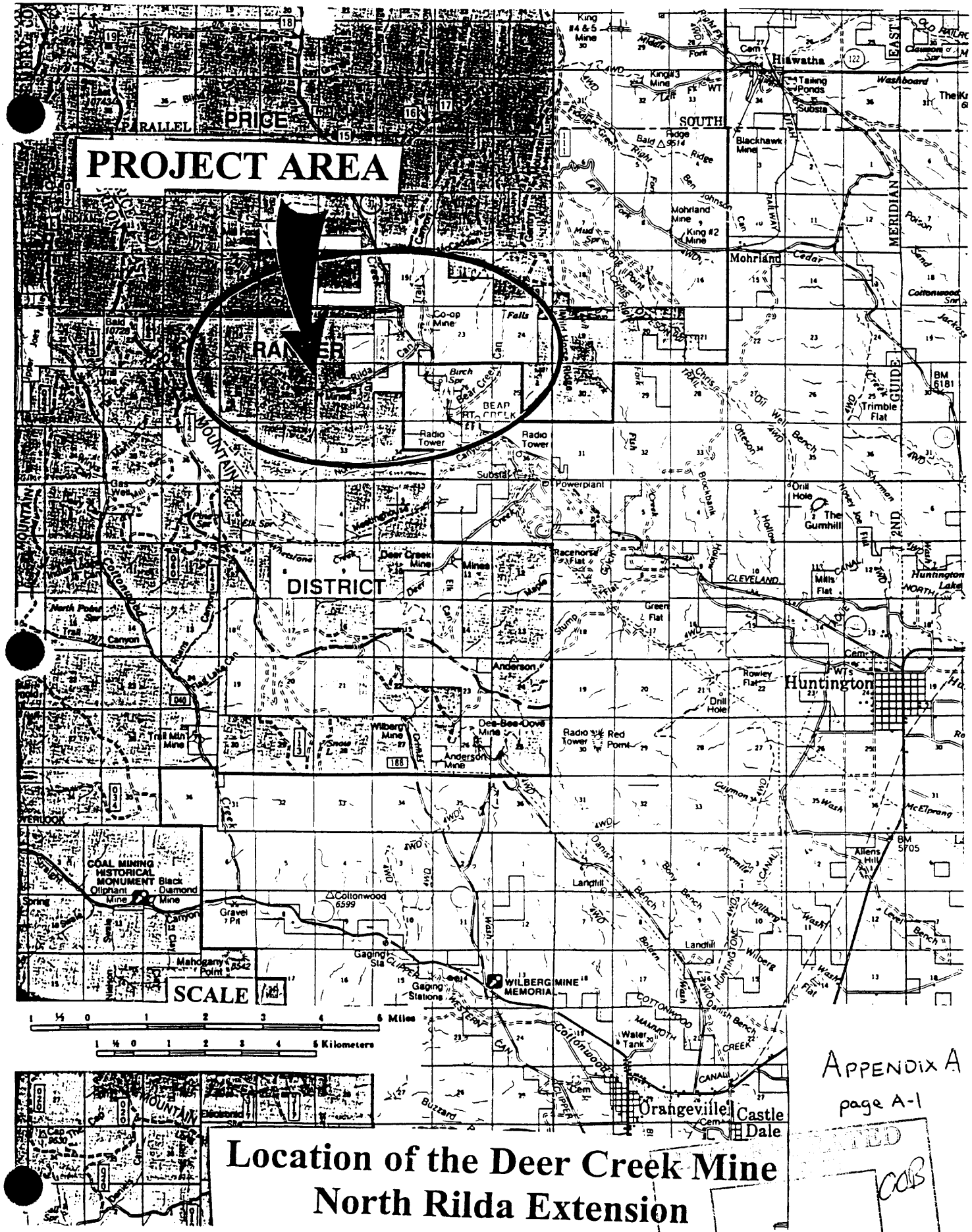
Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston. 336 pp,

Turner, F.B. 1958. Life history of the western Spotted frog in Yellowstone National Park. Herpetological 14:96-100.

Watkins, L.C. 1977. Euderma maculatum. Mammalian Series No. 77. 4 pp.

Woodsworth, G.C., G,P. Bell, and M.8. Fenton. 1981. Observations of the echolocation, feeding behavior, and habitat use of Euderma maculatum (Chiroptera: Vespertilionidae) in south central British Columbia. Can, J, Zoo 59:1099-1102.

INCORPORATED
EFFECTIVE
COB
UTAH DIVISION OIL, GAS AND MINING

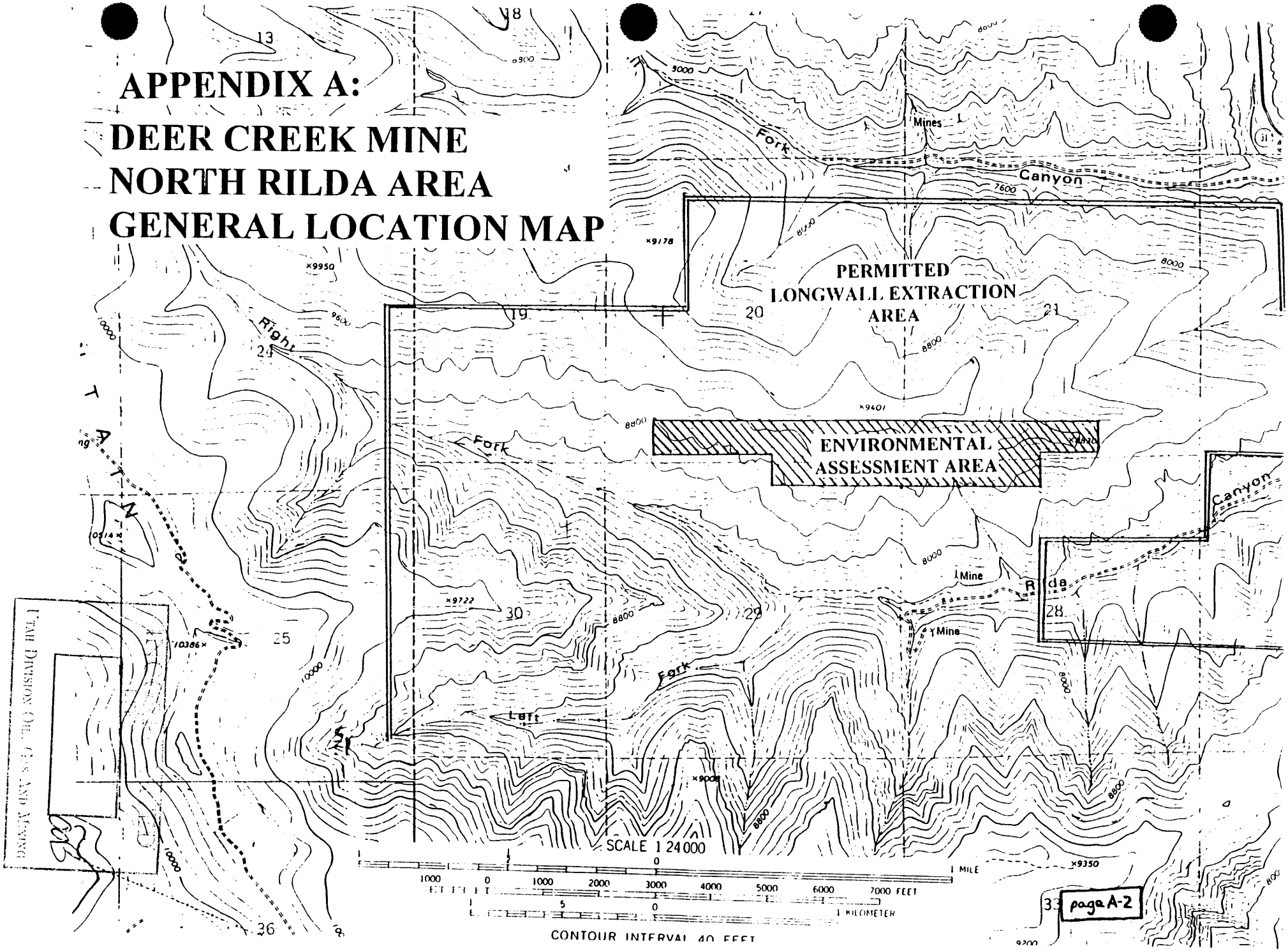


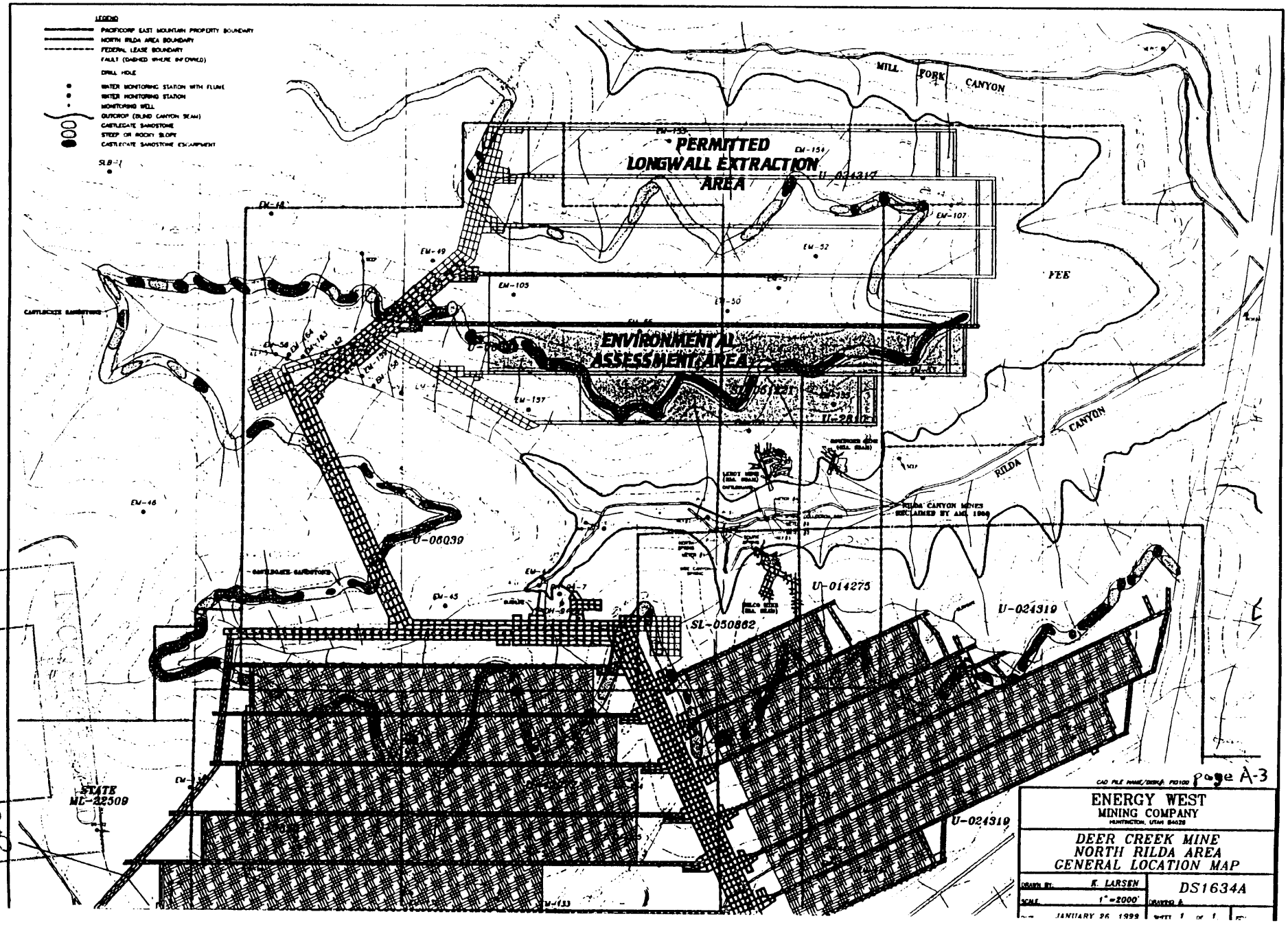
APPENDIX A
page A-1

Location of the Deer Creek Mine North Rilda Extension

RECEIVED
COB
Utah Division Oil, Gas And Mining

APPENDIX A:
DEER CREEK MINE
NORTH RILDA AREA
GENERAL LOCATION MAP





UTAH DIVISION OIL, GAS AND MINING

page A-3

ENERGY WEST MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
NORTH RILDA AREA
GENERAL LOCATION MAP

DRAWN BY: K. LARSEN	DS1634A
SCALE: 1" = 2000'	DRAWING #
JANUARY 26, 1999	SHEET 1 OF 1

R645-301-500 ENGINEERING SECTION

APPENDIX D

♦DECISION NOTICE AND FINDING OF NO SIGNIFICANT IMAPCT

Deer Creek Mine
North Rilda Extension

Decision Notice And Finding Of No Significant Impact

(Township 16 South, Range 7 East, Sections 20, 21, 28, and 29, Salt Lake Meridian)

USDA Forest Service, Intermountain Region
Manti-La Sal National Forest
Ferron/Price Ranger District
Emery County, Utah

I. INTRODUCTION

The Manti-La Sal National Forest and Bureau of Land Management (BLM) Price Field Office have prepared an environmental assessment (EA) for a proposal submitted by Energy West Mining Company, Deer Creek Mine. The proposed action is for the cooperating agencies to allow Deer Creek Mine to conduct full extraction longwall mining and subside the escarpments on the north slope of Rilda Canyon by amending their mining and reclamation plan for the North Rilda Canyon vicinity. The Office of Surface Mining also participated as a cooperating agency. The area of the proposal lies on National Forest System lands administered by the Manti-La Sal National Forest, Ferron-Price Ranger District, Emery County, Utah in Township 16 South, Range 7 East, Sections 20, 21, 28, and 29, Salt Lake Meridian.

The preferred alternative for implementation is Alternative 2 (Proposed Action). Alternative 2 is detailed in the EA on page II-1. Alternative 2 would permit Deer Creek Mine to conduct full extraction, longwall mining beneath the Castlegate Escarpment on the north slope of Rilda Canyon, which would lead to surface subsidence and probable rockfalls.

To implement Alternative 2: the Forest Service would consent to, and the BLM would approve, a change to the Resource Recovery and Protection Plan (R2P2), and the Forest Service would consent to, and the Utah Division of Oil, Gas and Mining would approve the amendment to Deer Creek Mine's mining and reclamation plan.

II. DECISION

I have decided to implement Alternative 2 as described in the Environmental Assessment (EA, pp.II-1) and summarized in this document.

I consent to the modification of the R2P2 by the BLM, and consent to approval of the amendment of the Mining and Reclamation Plan by DOGM which would allow Energy West's Deer Creek Mine to conduct full extraction longwall mining and subside the escarpments in the north slope of Rilda Canyon as shown in Appendix A. Conditions of my consent are as follows:

1. Energy West will post warning signs at specified points in Rilda Canyon, warning recreational users of the potential rockfall hazards, as stated in their proposal.

2. All commitments in the mining and reclamation plan will be adhered to.

3. Energy West will also monitor subsidence through their mine plan requirements and provide higher resolution monitoring data for the north slope of Rilda Canyon by providing a complete photographic

RECEIVED
Utah Division Oil, Gas And Mining

record, including before and after photograph sets of the escarpment area; and by installing prisms for accurate surveying on the top of the escarpments to determine when subsidence is substantially complete.

My decision will be implemented through the issuance of this Decision Notice. Forest Service regulations require the permittee to secure any additional state or federal permits or authorizations required by law.

III. RATIONALE FOR THE DECISION

This decision was made after careful consideration of the contents of the Environmental Assessment, public involvement, and the entirety of the supporting record. No one fact or single piece of information led to my decision. Rather, a combination of factors contributed to it. I have summarized some of my key considerations in the following sub-parts.

Relationship to the Purpose and Need:

The general purpose and need for this project is to accomplish the following goal of the Forest Plan: "Provide appropriate opportunities for and manage activities related to locating, leasing, development, and production of mineral and energy resources" (Forest Plan, p. III-4).

The project-specific purpose and need of the proposed action is to maximize coal recovery and extend the mine life. This purpose and need also allows the BLM to achieve maximum economic recovery of coal from the Federal Coal Lease.

My decision wholly meets the project's purpose and need (EA, p. I- 2). Meeting this purpose and need also allows the BLM to meet their responsibility to guarantee that all recoverable coal reserves are identified to achieve maximum economic recovery (MER) of coal.

Relationship to Other Alternatives Considered:

I have also reviewed the other alternative analyzed in the Environmental Assessment (EA, pp. II-1).

Alternative 1 (no action) would not meet Forest Plan direction to "Provide appropriate opportunities for and manage activities related to locating, leasing, development, and production of mineral and energy resources." (Forest Plan, p. III-4), nor would it allow the BLM to meet their responsibility of MER.

Relationship to Existing and Potential Resource Conditions:

I have considered existing resource conditions and potential environmental effects in making this decision (EA, Chapter 3 & 4; Project Record). The design of Alternative 2 and included stipulations will adequately provide for the proposed activity consistent with Forest Service land management direction, and applicable laws and regulations.

Relationship to Public Involvement:

Public comments were sought and considered throughout the planning process for this project (refer to Section V of this document for a summary of public involvement). I have reviewed and considered the issues and concerns identified during the scoping process. My decision considers all public comments received.

RECEIVED
UTAH DIVISION OIL, GAS AND MINING

Relationship to Laws and Regulations:

My decision is consistent with applicable laws, regulations, and policies (refer to Section VII of this document).

IV. SUMMARY OF ALTERNATIVES CONSIDERED

Two alternatives were considered as part of this project; Environmental Assessment (EA, pp. II-1 - II-2). A summary of the alternatives considered in detail follows.

Alternative 1 - No Action

Forest Service would not consent to the proposed action and mining would continue under the approved R2P2 and MRP. Subsequently, the BLM would not approve the proposed amendment to the R2P2 and DOGM would not approve the corresponding mine permit amendment. Alternative 1 addresses the need to provide a "No Action" alternative (40 CFR 1502.14) and provides a benchmark for evaluating the effects of implementing the proposal. The operator would not be permitted to conduct full extraction longwall mining under the escarpment.

Though full support mining is already permitted under the current mining plan, the reserves would not be economical to mine (personal communication with Chuck Semborski, Energy West Mining Co., June 1999, and George Tetreault, BLM, July 1999). No mitigation measures or monitoring would be required as part of this alternative, beyond what is already in the mining and reclamation plan.

Alternative 2 - Consent to Mining as Proposed

This alternative wholly responds to the purpose and need.

The Forest Service would consent to the modification of the R2P2 by the BLM, and consent to approval of the amendment of the Mining and Reclamation Plan by DOGM which would allow Deer Creek Mine to conduct full extraction longwall mining and subside the escarpments in the north slope of Rilda Canyon as shown in Appendix A.

Additionally, Energy West would post warning signs at specified points in Rilda Canyon, warning recreational users of the potential rockfall hazards, as stated in their proposal. All commitments in the mining and reclamation plan would be adhered to.

The Energy West would also monitor subsidence through their mine plan requirements and as proposed, provide higher resolution monitoring data for the north slope of Rilda Canyon by installing prisms for accurate surveying on the top of the escarpments to determine when subsidence is substantially complete.

These commitments are made in the project proposal and are further identified in the EA (p. II-1).

V. PUBLIC INVOLVEMENT

Internal scoping for this project included review by various Forest Service resource specialists such as the geologist, hydrogeologist, botanist, wildlife biologist, range conservationists, recreation specialist, and landscape architect.

External scoping consisted of notice in the Forest's *Schedule of Proposed Actions*, Legal Notice published in the Sun Advocate (May 5th 1998), a News Release to the Sun Advocate from which an

UNCLASSIFIED
UTAH DIVISION OIL, GAS AND MINING

article was written about the project (May 5th, 1998), and by letter to a 18-person mailing list. Those individuals to whom letters were mailed included: Federal, State, and local governmental or land management entities; adjacent landowners and mining companies; range permittees; and others known to be potentially interested or affected. Three letters were received in response to external scoping. The entirety of these letters can be found in the project record.

The completed EA was released for public comment on July 19th, 1999, and two responses were received, both of which are included in the project file, and are addressed in the EA's "Response to Comments" (EA, Appendix B) included with this Decision Notice. The first response was from Clint Sherman, in the form of a telephone call which was documented by Aaron Howe, Forest Engineer, and the second comment was a letter received from the attorney for Huntington-Cleveland Irrigation Co. These comments and the responses were considered in conjunction with the EA in making this decision.

VI. FINDING OF NO SIGNIFICANT IMPACT

Based on my review of the EA and supporting record, I have determined that this decision does not constitute a major Federal action significantly affecting the quality of the human environment, as defined in the Code of Federal Regulations title 40 part 1508, section 27 (40 CFR 1508.27) in either context or intensity. Therefore, it is my decision that an Environmental Impact Statement is not necessary, and will not be prepared. My rationale for this determination is summarized below.

Context

Locality. Implications of this decision are primarily for the Rilda Canyon area. The effects on public land use and users would remain consistent with that which is currently occurring. (EA, Project Record)

Affected Interests. Affected interests for this project are primarily recreation enthusiasts, State resource management agencies, and other entities with interests in wildlife and water management. (EA, Project Record)

Affected Region. The decision is a site-specific action with impacts primarily to the local area. The context of this decision is comparable to many projects on the Manti-La Sal National Forest and would not measurably affect the region.

Society. No effects are anticipated to society as a whole, though local communities are expected to benefit from the extended life of the mine and associated employment opportunities.

Intensity

1. Consideration Of Beneficial And Adverse Impacts. Consideration of beneficial and adverse impacts has been made in the EA (Chapter 4). Impacts of this decision will be similar to that of past projects involving undermining of escarpment. Although both beneficial and adverse effects are disclosed, none are of enough magnitude to be considered significant.

2. Consideration Of Public Health And Safety. Public health or safety issues concerning this decision were considered through the analysis. The Colorado Rockfall Simulation Program was applied and risks of dislodged rocks reaching the road were established to be very low. Additionally, mitigation in the form of signing has been made a part of the decision to ensure public health and safety (EA, II-1).

3. Consideration Of Unique Characteristics Such As Proximity To Historic Or Cultural Resources, Park Lands, Prime Farmlands, Wetlands, Wild And Scenic Rivers, Or Ecologically Critical Areas. Historic and cultural resources are addressed in the following Item 8. There are no prime farmlands, rangeland, or forest

CAB
Utah Division Oil, Gas And Mining

land as defined in the Secretary of Agriculture's Memorandum Number 1827, Supplement 1, identified on the Forest (Forest Plan, p. II-57). Wetlands would not be affected as this decision requires avoidance of the wetlands as described in the EA. There are no parklands or wild and scenic rivers identified in the Forest Plan. The area of my decision has not been identified by any source as an ecologically critical area (Project File - Biological Assessment and Evaluation).

4. Consideration Of The Degree To Which The Effects On The Quality Of The Human Environment Are Likely To Be Highly Controversial. This decision is not unique, several other projects involving escarpment undermining have been approved over the last 10 years (Trail Mountain Mine, SUFCo Mine). Effects on the quality of the human environment are understood and are not highly controversial. Scoping on the proposed action and solicitation of comments on the Environmental Assessment and pre-decision demonstrated that there is not much public controversy over potential effects. No information or data has been presented to demonstrate that the effects are highly controversial.

5. Consideration Of The Degree To Which The Possible Effects On The Human Environment Are Highly Uncertain Or Involve Unique Or Unknown Risks. This decision is not unique, several other projects involving escarpment undermining have been approved over the last 10 years (Trail Mountain Mine, SUFCo Mine). The Manti-LaSal National Forest has experience in implementing and monitoring similar projects, the effects of which have been found to be reasonably predictable. No effects from this decision would be classified as highly uncertain or involving unique or unknown risks.

6. Consideration Of The Degree To Which The Action May Establish A Precedent For Future Actions With Significant Effects Or Represents A Decision In Principle About A Future Consideration. This decision is not precedent setting.The Manti-LaSal National Forest generally considers and analyzes the permitting of several mine plan amendments or modifications each year. Any future proposals would have to be evaluated on their own merits based on the issues and effects related to the location, timing and intensity of each action.

7. Consideration Of The Action In Relation To Other Actions With Individually Insignificant But Cumulatively Significant Impacts. No reasonably foreseeable future projects have been identified that would in connection with this decision produce cumulative effects beyond those currently occurring. The limited scale of activity creates minimal individual effects, as well as minimal cumulative effects when added to the existing situation and other potential activities.

8. Consideration Of The Degree To Which The Action May Adversely Affect Areas Or Objects Listed In Or Eligible For Listing In The National Register Of Historic Places Or May Cause Loss Or Destruction Of Significant Scientific, Cultural, Or Historical Resources. Record and field reviews indicate that no cultural or historic sites would be affected by this decision (EA, p.III-11 and Project Record).

9. Consideration Of The Degree To Which The Action May Adversely Affect An Endangered Or Threatened Species Or Its Habitat Has Been Determined Not To Be Critical Under The Endangered Species Act. The US Fish and Wildlife Service has been included in the process. A Biological Assessment has been conducted for this decision (Project Record -Biological Assessment and Evaluation). All known endangered or threatened species were considered. The Biological Evaluation concludes that this decision will have "no effect" to listed or proposed species (EA, p. IV-9).

10. Consideration Of Whether The Action Threatens A Violation Of Law Or Requirement Imposed For The Protection Of The Environment. To the best of my knowledge, this decision does not threaten violation of any laws and regulations imposed for the protection of the environment (refer to Section VII of this document).

003
Utah Division Oil, Gas And Mining

VII. FINDINGS REQUIRED BY OTHER LAWS AND REGULATIONS

To the best of my knowledge, this decision complies with all applicable laws and regulations. In the following, I have summarized the association of my decision to some pertinent legal requirements.

Federal Land Policy and Management Act of 1976: This Act allows the granting of land use permits on National Forest System lands. The regulations at Code of Federal Regulations Title 36 part 251 (36 CFR 251) guide the issuance of permits under this Act. Land use permits are granted on National Forest System lands when the need for such is consistent with planned uses.

National Forest Management Act of 1976: The Forest Plan was approved November 5, 1986, as required by this Act. This long-range land and resource management plan provides guidance for all resource management activities in the Forest. The National Forest Management Act requires all projects and activities to be consistent with the Forest Plan. The Forest Plan has been reviewed in consideration of this project. This decision will be consistent with the Forest Plan.

Potential effects to wildlife resources are also evaluated (EA pp. IV-4 - IV-6), including identified sensitive species, in compliance with the Act direction. "No Impact" or "May Impact Individuals or Habitat, But Not Likely to Contribute to a Trend Towards Federal Listing or Loss of Viability to the Population or Species" determinations were reached for all species analyzed.

Coal Leasing Amendments Act of 1975: Forest Service consent to the conditions of approval is required under this act. This decision document constitutes my consent on behalf of the agency.

Mineral Leasing Act of 1920: The Bureau of Land Management (BLM) is the responsible agency for permitting, under the Mineral Leasing Act of 1920, as amended. The Forest Service, as the surface management agency, must consent to the BLM decisions pertaining to leasing actions or exploration activities. This decision document constitutes my consent on behalf of the agency.

Surface Mining Control and Reclamation Act of 1977(SMCRA): This act gives the Department of the Interior, Office of Surface Mining (OSM), primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. Pursuant to sections 503 and 523 of SMCRA, under the oversight of the OSM, the Utah Division of Oil, Gas and Mining regulates surface coal mining and the surface effects of underground coal mining on Federal and non-Federal lands within the State of Utah. On National Forest lands, consent must be obtained from the Forest Service, as the surface management agency, prior to approval of mining activities, including exploration drilling. This decision document constitutes my consent on behalf of the agency.

National Historic Preservation Act: Compliance with this Act and the American Indian Religious Freedom Act are addressed in Section VI of this document.

Endangered Species Act: Compliance with this Act is addressed in Section VI of this document.

National Environmental Policy Act: The entirety of documentation for this project supports that the project complies with this Act.

RECEIVED
Utah Division Oil, Gas And Mining

VIII. IMPLEMENTATION DATE AND APPEAL OPPORTUNITY

This Forest Service decision is subject to appeal under 36 CFR 215. Permit holders or permit applicants responding to Forest Service issued prospectus who may be affected by this decision have the choice to appeal under 36 CFR 215 or 36 CFR 251.

The Forest Service decision is subject to administrative review by the Regional Forester pursuant to the above cited regulations. Any written appeal must be postn arked or received by the Appeal Deciding Officer within 45 days from the day after publication of the legal notice in the Price *Sun Advocate* newspaper. Appeals should be sent to Regional Forester-Intermountain Region, 324 25th Street, Ogden Utah 84401 on or before December 17th, 1999. Appeals must meet the content requirements of 36 CFR 215.14.

IX. CONTACT PERSON

For additional information concerning this decision, please contact Jeff DeFreest at the Ferron/Price Ranger District (address: 599 West Price River Drive, Price, UT 84501; telephone: 435-637-2817).

X. SIGNATURE AND DATE

JANETTE S. KAISER
Forest Supervisor (Responsible Official)
Manti-La Sal National Forest

Date 11-1-99

RECEIVED
NOV 1 1999
DIV. OF OIL, GAS & MINING
UTAH DIVISION OIL, GAS AND MINING

October 1999

RESPONSE TO COMMENTS
Deer Creek Mine
North Rilda Extension
Environmental Assessment
APPENDIX B

Introduction:

The Environmental Assessment was released for public comment on July 19, 1999. There were two parties that responded with formal comments.

The first of which was in the form of a telephone call from Mr. Clint Sherman of Cleveland Utah and documented by Aaron Howe, Forest Engineer.

The second comment received was in the form of a letter from the law firm of Nielsen and Senior on the behalf of Huntington-Cleveland Irrigation Company.

Comments and Response to Comments:

A. Phone Call with Clint Sherman:

Comment:

Mr. Sherman apparently uses the mid to upper portion of this area (adjacent to escarpment) in the spring time and is concerned that falling rock could land on him as he collects antlers or that rocks may land or roll into the road.

Response:

Warning signs are to be installed by the Energy West at extents of the project area advising recreational users of the potential for rockfalls near the escarpment.

The rockfalls are not expected to reach the road. The Colorado Rockfall Simulation Program was applied to the proposed subsidence area (project file) and the analysis does not show any rocks reaching the road. If rocks would reach the road, the mine would attend to removing them.

Comment:

Mr. Sherman is concerned about the potential for the falling rock to displace the elk that winter adjacent to the escarpment.

RECEIVED
OOB
UTAH DIVISION OIL GAS AND MINING

Response:

The escarpment would not all fail at once because the mining progresses rather slowly and the elk should not move out of the area due to periodic rock falls.

Comment:

Mr. Sherman was concerned about the potential for the Rilda (canyon) road to be closed (administratively) during the subsidence period.

Response:

Administrative closure of the road was not part of the proposal or required mitigations. It should also be noted that the Rilda Canyon Road is a county road and that Emery County would have to make a decision to restrict use up the canyon.

B. Nielsen & Senior Letter:

Comment:

"The EA at page I-3 recognizes water resources may be impacted, but then attempts to down play the importance of a single known seep within the project area."

Response:

The EA identifies one seep near the eastern end of the project area. The EA describes this feature on page I-3 and indicates that the "seep (no live surface water) near the eastern end of the project area on the ridge between Rilda and Mill Fork Canyons" is "too small to be developed for a water source." It is further discussed in the EA on page IV-4, "The seep on the ridge could be altered as a result of mining and subsidence leading to corresponding vegetation changes.". Subsidence/alteration of this seep is expected to result in the seep location migrating down-dip but no diminishment of flow is anticipated.

Comment:

"It is also unclear whether the project area and adjacent areas were carefully surveyed for additional seeps and springs."

Response:

The area has been carefully surveyed for seeps and springs. PacifiCorp initially conducted the East Mountain Spring and Seep Surveys during the 1979 and 1980 field seasons. Additionally, in cooperation with the NEWUA and Huntington Cleveland Irrigation Company, PacifiCorp conducted a comprehensive hydrologic investigation of the Rilda Canyon Springs during 1989. Further analysis was conducted by PacifiCorp as part of their Mining and Reclamation Plan for the North Rilda Permit area (Deer Creek MRP, Vol. 11, approved July 1997).

INCORPORATED
00B
UTAH DIVISION OIL, GAS AND MINING

Comment:

"Additionally, the relationship between groundwater in the project area and the springs utilized by NEWUA is not adequately addressed."

Response:

The relationship is identified on page III-2 of the EA. "The springs are fed by the alluvial system in Rilda Creek and the majority of their recharge is from springs at the head of Rilda Canyon, west of the project area. A north-south fracture system is also thought to partially feed the NEWUA springs." Potential impacts to the springs are identified in Chapter 4 under each alternative considered.

Alternative 1 (No Action)

"The north-south fracture system thought to be partially feeding the NEWUA springs could be altered by full support mining authorized by the current MRP and R2P2."

Alternative 2 (Preferred)

"Any unforeseen damage to permitted facilities on National Forest System lands would be required to be repaired under the existing lease stipulations. Likewise, water loss (quality or quantity) would require replacement, and damages done to stream and riparian environments would also be repaired by the mine under their existing mining and reclamation plan."

"The north-south fracture system thought to be partially feeding the NEWUA springs could be altered by full support mining authorized by the current MRP and R2P2 or by the action alternative allowing longwall mining and subsequent subsidence."

"The seep on the ridge could be altered as a result of mining and subsidence leading to corresponding vegetation changes."

Recent information from Chuck Semborski (project file) pertaining to the presence of the north-south fracture system indicates that "mining has not encountered any structural anomalies along the proposed north-south trend and interception of ground water has been minimal". This information is based on their development mining of the length of Rilda Ridge in the already permitted 4 panels north of the project area considered in this EA and decision. There is no reason to believe that the fracture system would be encountered mining the two panels to the south included in this project area.

Comment:

"While the EA acknowledges the Springs in Rilda Canyon that provide drinking water for those served by North Emery Water Users Association ("NEWUA"), it fails to recognize the holder of the water rights under which NEWUA receives its water."

COB
Utah Division Oil, Gas And Mining

Response:

NEWUA is the Special Use Permit holder for the subject springs in Rilda Canyon for the authorized purpose of providing culinary water. The specific ownership of the water is not germane to this analysis, though it is recognized that Huntington-Cleveland Irrigation Company does hold the water rights and NEWUA receives their water from Huntington-Cleveland Irrigation Company. Potential impacts to the water resources are considered regardless of who the specifically owns the water rights.

Comment:

"Tellingly, there is not a single hydrologist on the interdisciplinary team."

Response:

Liane Mattson (former Hydrogeologist on the Manti-LaSal NF) was involved with the review of the submittal (proposal) from Deer Creek Mine, has been involved with numerous hydrological studies in the vicinity, and participated in the preparation and review of this Environmental Assessment as an extended IDT member. Her name was inadvertently left off of the EA.

INCORPORATED
FEB 2 1998
003
UTAH DIVISION OIL, GAS AND MINING

R645-301-500 ENGINEERING SECTION

APPENDIX E

♦DOGM LETTER - CONSENT TO CONDUCT MINING

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Kathleen Clarke
Executive Director

Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

November 10, 1999

Chuck Semborski, Environmental Supervisor
Energy West
P. O. Box 310
Huntington, Utah 84528

Re: Conditions Revisited for Deer Creek Mine Permit, PacifiCorp, Deer Creek Mine, ACT/015/018, Folder #3, Emery County, Utah

Dear Mr. Semborski:

The recent Decision Notice and Finding of No Significant Impact document (copy attached) issued by the Manti-La Sal National Forest has prompted us to revisit the Deer Creek Mine Permit and the attached conditions. Condition Number 3 is as follows:

> *Mining in the "North Rilda Lease" area is authorized to the extent that the Surface Managing agency (U. S. Forest Service) has provided consent, per letters dated July 3, 1997 and July 15, 1997 (attached.)*

We recognize that the Forest Service document adds another level of consent to the already issued permit. This letter authorized PacifiCorp to conduct mining in the North Rilda Lease area in accordance with the consent granted in the Forest Service Decision Notice. This includes the conditions identified in the Decision Document. Of course this authorization becomes effective only after the Decision Document has gone through the appeals period and is finalized.

Please keep us apprised of any changes to your mine plan as a result of this action. If you have any questions, please call me.

Sincerely,

Daron R. Haddock

Daron R. Haddock
Permit Supervisor

tm
Enclosure
cc: Janette Kaiser, USFS
Richard Manus, BLM
Price Field Office
O:\015018.DER\FINAL\fonsicondltr.wpd

INCORPORATED
EFFECTIVE:
DOB
UTAH DIVISION OIL, GAS AND MINING

R645-301-500 ENGINEERING SECTION

APPENDIX F

♦NORTH RILDA CANYON FACILITIES GEOTECHNICAL INVESTIGATION

R645-301-500 ENGINEERING SECTION

APPENDIX F

PacifiCorp is proposing to conduct a geotechnical evaluation of the proposed North Rilda Canyon Portal Facilities during the month of November 2003. The purpose the study is to define the characteristics of the surface and subsurface material in the area of the proposed facilities. This analysis will include structure and foundation recommendations for the facilities located on the cut and fill area of the pads. Recommendations for the new construction need to be specified to assist the project Architect, Engineer and Contractor in proper design and construction details. Also included in the recommendations will be methods used during construction to handle foundations on areas of native soil, native fill and fill from the excavated underground access slope. Findings of the geotechnical evaluation will be included as Appendix B when available.

R645-301-500 ENGINEERING SECTION

MAPS

♦ MAP 5-1: NORTH RILDA CANYON PORTAL FACILITIES: PRE-DISTURB TOPOGRAPHY MAP

♦ MAP 5-2: NORTH RILDA CANYON PORTAL SURFACE FACILITIES

♦ MAP 5-3: NORTH RILDA CANYON PORTAL SURFACE FACILITIES CROSS SECTION (2 SHEETS)

♦ MAP 5-4: NORTH RILDA CANYON PORTAL FAN ACCESS ROAD & FAN PAD CROSS SECTIONS

♦ MAP 5-5: NORTH RILDA CANYON PORTAL EXPLOSIVE MAGAZINE & ACCESS ROAD CROSS SECTIONS

Map(s) is kept with this application located in the Public Information Center of our Salt Lake City office.

R645-301-600 GEOLOGY SECTION

TABLE OF CONTENTS

R645-301-610 INTRODUCTION 6-1

R645-301-611 GENERAL REQUIREMENTS 6-1
R645-301-611.200 Proposed operations as given under R645-301-630 6-1

645-301-612 CERTIFICATION 6-1

645-301-620 ENVIRONMENTAL DESCRIPTIONS 6-1
A. REGIONAL GEOLOGY 6-2
B. REGIONAL GEOLOGY SEDIMENTARY FORMATIONS 6-3
C. STRUCTURAL FEATURES 6-6
D. GEOLOGY OF THE RILDA CANYON PORTAL FACILITIES 6-7

R645-301-622 CROSS-SECTIONS, MAPS, AND PLANS 6-7
R645-301-621.200 Nature, Depth, and Thickness of the Coal Seams to Be Mined 6-7
R645-301-621.300 All Coal Crop Lines of the Coal to Be Mined 6-9
R645-301-621.400 Location and Depth of Gas and Oil Wells 6-9

R645-301-623 ENVIRONMENTAL GEOLOGIC INFORMATION 6-9
R645-301-623.100 Acid- and Toxic-Forming Strata 6-9
R645-301-623.200 Reclamation Potential 6-10
R645-301-623.300 Subsidence Control Plan 6-11

R645-301-624 GEOLOGIC INFORMATION 6-11
R645-301-624.200 Overburden Removal 6-13
R645-301-624.230 Chemical Analyses of the Coal Seam for Acid- and Toxic Forming Materials 6-14
R645-301-624.310 Drill Hole Logs 6-14
R645-301-624.320 Chemical Analyses for Acid- or Toxic- Forming Materials 6-14
R645-301-624.330 Pyritic and Total Sulfur Chemical Analyses 6-14

R645-301-627 DESCRIPTION OF OVERBURDEN 6-14

R645-301-630 OPERATION PLAN 6-16

R645-301-631 CASING AND SEALING OF BOREHOLES 6-17

R645-301-632 SUBSIDENCE MONITORING 6-18

R645-301-641 SEALING OF BOREHOLES 6-18

LIST OF FIGURES

GF-1 Stratigraphy of East Mountain
GF-2 North Rilda Area - Geology of the Rilda Canyon Portal Facilities
GF-3 Location of Star Point Sandstone Drill Holes

LIST OF APPENDICES

Appendix A Exploration Borehole Drilling and Abandonment
Appendix B Acid and Toxic Forming Analysis
(Star Point Sandstone Drill Logs)

LIST OF REFERENCES

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, *in* Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

R645-301-600 GEOLOGY SECTION

R645-301-610 INTRODUCTION

This part of the application provides a detailed description of the geology of the coal resources, surrounding strata, and surface features within the North Rilda Area including the North Rilda Canyon Portal Facility area.

Since 1971, detailed data on the geology of the coal deposits within the permit and surrounding area have been collected, compiled, and analyzed by PacifiCorp and several government agencies. Information collected by PacifiCorp is the result of exploratory drilling, field investigations, geologic mapping, field sampling, aerial photography, and mapping of underground mine workings.

PacifiCorp has also used numerous geologic reference works by previous authors and agencies specifically written about the coal deposits of this area for the preparation of this section.

R645-301-611 GENERAL REQUIREMENTS

The geology within and adjacent to the permit area is discussed in Sections R645-301-621 through R645-301-627.

R645-301-611.200 Proposed operations as given under R645-301-630

Proposed mining operations are discussed in section R645-301-500, including mine layout and sequencing.

645-301-612 CERTIFICATION

All maps, drawings and figures within R645-301-600 has been prepared by a licenced professional geologist.

645-301-620 ENVIRONMENTAL DESCRIPTIONS

In 1997 PacifiCorp received approval to expand its mining operations in Rilda Canyon (Refer to Introduction Section Figures A: Blind Canyon Seam and Figure B: Hiawatha Seam). This expansion involved increasing the size of the Deer Creek permit area by 1,960 acres. An

additional 50 acres was added in 1998 upon completion of a lease modification to Federal Lease U-06039 (modification Number 2). In 2001, PacifiCorp applied and received approval to modify Federal Lease U-06039 for third time for an additional 65.7 acres (modification Number 3).

Because of its northern location relative to the existing permit area and Rilda Canyon, the proposed new area of expansion is simply called the "North Rilda Area".

The Wasatch Plateau is one of several high plateaus in central Utah located along the western boundary of the Colorado Plateau geological province. The geology of this region is characterized by flat-lying sedimentary rocks, ranging in age from Paleozoic to Recent, with simple geologic structures such as gentle folds and mostly normal faulting. This thick "layer-cake" of sedimentary rocks has been deeply dissected by erosion. The North Rilda Area consists of the surface and subsurface coal resources that underlie the north end of East Mountain, one of several high, narrow east-west ridges that make up the Wasatch Plateau. Elevations range from 7,500 feet in the lowest areas to over 9,600 feet at the ridge top, resulting in a broad diversity of climatic conditions and flora and fauna over the area. Annual rainfall in the region ranges from about 10 inches per year in the lower canyon bottoms to over 30 inches per year in high elevation areas. The dry climate of this area promotes erosion by inhibiting plant growth at lower elevations and on south-facing slopes.

A. REGIONAL GEOLOGY

The Energy West Mining Company mines and permit areas are located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a series of high, flat-topped mesas flanked by heavily vegetated slopes which extend downward to precipitous cliffs. Below these cliffs, steep slopes gradually flatten out into a broad flat valley (Castle Valley) below. Topographic relief of up to 5,000 feet can be measured from the top of the plateau to Castle Valley below. Horizontal coal seams occur within the strata of the Wasatch Plateau, about halfway between the valley floor and the top. The following discussion summarizes the stratigraphy and structural geology of the region and within the North Rilda Area. The regional geology of the Colorado Plateau in which the Wasatch Plateau coal field is situated is fairly simple. Sedimentary rocks have been accumulating in this region since Permian time (refer to Figure GF-1, Figure Tab).

A broad, high, flat region that encompasses southeastern Utah, southwestern Colorado, northwestern New Mexico, and northern Arizona, the Colorado Plateau has been an area of relative stability while mountain-building episodes have occurred in surrounding regions. The thick accumulations of sedimentary rocks in this region are being deeply dissected by erosion, leaving the most recent coal reserves in the higher plateaus, where they are now being mined. The Energy West permit area covers portions of East Mountain and Trail Mountain, which are separated by Cottonwood Canyon, a deep, partially glaciated valley.

During late Cretaceous (Campanian) time, from 75 – 85 million years ago, the Wasatch Plateau region lay at the edge of the Western Interior Cretaceous Seaway, with the sea to the southeast and a range of mountains (the Sevier Orogeny) to the northwest. Streams from these mountains brought eroded sediments southeast to the sea. Stagnant areas between these stream and river channels contained swamps in which peat accumulated. These stream channel and coal swamp deposits are now called the Blackhawk formation, a member of the Mesaverde Group of Cretaceous formations. During Campanian time, the sea advanced and receded several times, leading to the formation of several stacked coal seams within the Blackhawk sediments. The coal seams present in the Energy West permit area are named from lowest (oldest) to highest (youngest) the Hiawatha, Cottonwood, and Blind Canyon Seams. The Hiawatha and Blind Canyon seams are separated by 30 – 100 feet of interburden.

B. REGIONAL GEOLOGY SEDIMENTARY FORMATIONS

Numerous sedimentary rock formations are exposed in the Wasatch Plateau both above and below the coal bearing Blackhawk formation. Mining and construction activities affect a number of these, and the composition, arrangement, and physical characteristics of these formations greatly affect the mining and hydrologic characteristics of the area.

The geologic formations exposed in the Energy West permit area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age (refer to Figures GF-1 and GF-2 [Figure Tab] and Volume 12 Mill Fork Lease Geologic Section Map MFU1823D). These formations, in ascending order from oldest to youngest, are the Masuk Shale member of the Mancos Shale, the Star Point Sandstone, the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation (all Cretaceous), and the North Horn Formation. The coal deposits are restricted to the lower portion of the Blackhawk Formation, about 2,500 feet below the top of the Plateau. Recent geologic deposits include numerous stream terrace gravels along streams and rivers, glacial till deposits in the upper reaches of Cottonwood Canyon, and alluvial and colluvial fills in all of the significant drainages.

The Masuk Shale is the upper-most marine member of the Mancos Shale and consists of light to medium gray marine mudstones. This formation weathers readily, forming gray slopes that are often covered by debris and little or no vegetative cover. The Masuk shale is several hundred feet in thickness, and is the lowest and oldest of the geologic units exposed in the permit area. This formation is generally devoid of groundwater.

Overlying and intertonguing with the Masuk Shale is the Star Point Sandstone, a beach-front sandstone. In the East Mountain area the Star Point Sandstone ususally consists of three prominent massive cliff-forming beach-front sandstones totaling about 400 feet in thickness. These sandstone "tongues" are named from bottom to top: the Panther, the Storrs, and the Spring Canyon. In between the three tongues are beds of the Masuk Shale. The intertonguing of the Star Point and Masuk shale represents three transgression / regression episodes along the shoreline of the Cretaceous Interior seaway. The upper contact of the Star Point Sandstone is usually abrupt and readily identifiable on outcrops. Even though the Star Point Sandstone underlies almost the entire permit area, the low permeability and lack of recharge limit its usefulness as a water producing aquifer. The Star Point Sandstone occasionally exhibits aquifer characteristics in localized areas. These are isolated occurrences where regional faults have created secondary permeability and have been intersected by major canyons with perennial streams. An example of this type of occurrence is Little Bear spring located in Huntington Canyon.

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones, and coal. Although coal beds are generally found throughout the Blackhawk Formation, the thickest economically mineable seams are restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are mostly fluvial stream channel deposits and increase in number in the upper portions of the formation. Fluvial sandstone channels that are in contact with the top of the coal seams occasionally cut into the coal (due to the erosion of peat by stream erosion during deposition) and create thinned coal zones called "scours." Many of the tabular sandstones and sandstone channels contain perched water, mostly in fractures, joints, and bedding planes. The permeability of these sandstones is relatively low. Mudstones surrounding these channels usually function as aquicludes. The total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet. The Blackhawk Formation usually forms a broad, consistent slope between the Star Point Sandstone cliffs below and the Castlegate Sandstone cliffs above.

The Castlegate Sandstone is the lower member of the Price River Formation. The Castlegate Sandstone sits on top of the Blackhawk Formation and forms a prominent 300-foot cliff in highly eroded areas of the southern outcrops of the permit area (the southern end of the Cottonwood and Trail Mountain mines), steep blocky slopes in moderately eroded areas (Rilda Canyon), and

occasional blocky outcrops in forested or heavily vegetated areas (Mill Fork Canyon). The Castlegate Sandstone consists of about 200 to 400 feet of coarse-grained, arkosic, light tan fluvial sandstones; pebble conglomerates; and minor layers of mudstone.

The Upper Price River Formation, which overlies the Castlegate Sandstone, is about 600 to 800 feet thick and forms slopes which extend upward from the Castlegate Sandstone escarpment. The Upper Price River Formation is comprised predominantly of fine to coarse- grained sandstone but commonly contains mudstone beds between the point bar deposits. Although some mudstones are present, fine-grained, poorly sorted (occasionally conglomeratic) sandstones dominate the Upper Price River Formation.

The North Horn Formation is about 500 to 1000 feet thick in the East Mountain area. The North Horn Formation spans the Cretaceous-Tertiary boundary (65 million years ago). Mudstones and claystones dominate the rock types present and are generally gray to light brown in color, although black, pink, purple and greenish colors have been seen. The lower two thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone. Localized, lenticular sandstone channels are present throughout the formation. The sandstone beds are more common near the upper and lower contacts of the formation. The North Horn formation, because of the soft rock types present, is prone to slumping. Widespread areas of slumping and hummocky terrain are present in North Horn outcrops.

The Flagstaff Limestone is the youngest (Paleocene) and highest formation exposed in the permit area and consists of dense, white to light gray lacustrine limestone with abundant fossil shells. Resistant to erosion, remnants of 100 to 150 feet of this formation remain, forming caps on the highest plateaus.

Between the time of sediment accumulation and erosion, the sedimentary rocks of the Wasatch plateau were intruded by widely scattered igneous dikes. The approximate age of these dikes ranges from 8 to 24 million years. Though more common in the northern parts of the Wasatch Plateau, several dikes are known to exist within the Genwal Mine, just to the north of the northern permit boundary. These dikes are only a few feet or inches wide, and are traceable for only a few hundred feet. The extent and continuity of these dikes at depth is unknown, and the effects on mining, if any, are unknown at this time.

Stream terrace gravels have been deposited along the major rivers and valley floors at various historic erosional levels, and lay unconformably on top of the Masuk shale. These terrace gravels are extensively used locally for construction gravels. Some are partially cemented together by caliche – type calcareous cement. None of these terrace gravels occur at or above the coal mining levels. None of these gravels contain groundwater.

Glacial-till deposits are present in the upper half of Cottonwood Canyon. The classic 'U"-shaped valley and presence of a terminal moraine show that this valley contained a small glacier during the last Pleistocene ice age (10,000 to 12,000 years ago). The depth of this till ranges from 80 to 150 feet thick at the valley floor. The groundwater characteristics of this till and the groundwater hydrology of Cottonwood Canyon are being closely monitored by Energy West Mining Company.

Most of the main drainages and side canyons in the permit area contain alluvial fill as a valley floor material. The depth of this fill material can be up to 100 feet in some of the major stream valleys. Seasonal streams, ground water, and various springs are present in these alluvial fills. The groundwater and surface water hydrology of these alluvial materials are closely studied and monitored by Energy West Mining Company.

C. STRUCTURAL FEATURES:

Several important structural features, the Straight Canyon Syncline, Flat Canyon Anticline and Huntington Anticline, the Roans Canyon Fault Graben, Mill Fork Fault Graben, Left Fork Fault Graben, Pleasant Valley Fault, and the Deer Creek Fault, have been identified adjacent to and within the Mill Fork permit area (refer to Volume 12 R645-301-600 Map MFU-1823D, Geologic Formations Map).

Folding:
Strata in the Mill Fork area are gently folded in two broad structural features. The Flat Canyon Anticline crosses the southeastern portion of the permit area. This anticline trends southwest to northeast, and plunges to the southwest. Dips in the anticline range from two to six degrees with the south limb dipping the steepest.

To the north, the north limb of the Flat Canyon Anticline becomes the south limb of the Crandall Canyon Syncline, a flat-bottomed syncline. This syncline also trends southwest to northeast. Dips on the northwest side are much steeper than on the southeast side.

Faulting:
The only known faulting near the North Rilda Area is the Mill Fork fault graben. The Mill Fork fault graben passes to the southeast of the permit area (refer to Volume 12 R645-301-600 Map MFU-1823D, Geologic Formations Map). This fault graben was crossed in ARCO's Huntington Canyon #4 Mine in Mill Fork Canyon and has a displacement of about twenty five (25) feet on the each side. The trend of this fault zone is approximately N 40° E. Based on projections from maps of #4 Mine, this graben should pass by the through the northwest corner of the North Rilda Area, between the Mill Fork lease and the existing Deer Creek Mine. Where it crosses the

northern end of East Mountain, the fault has been mapped to have a displacement of thirty (30) feet down on the northwest side. Deer Creek mine workings have not intercepted this fault zone and exploration drilling in the right fork of Rilda canyon does not show any displacement, indicating that the displacement of the fault zone is too small to measure with exploration drilling, or that it has disappeared in this area. This fault zone does not appear in any surface outcrops.

D. GEOLOGY OF THE NORTH RILDA CANYON PORTAL FACILITIES

Geology of the North Rilda Canyon Portal Facility consists of following formations in ascending order: Star Point Sandstone, Blackhawk, Castle Gate Sandstone and Upper Price River (refer to Figure GF-2, Figure Tab). As discussed in the Land Use Section, the Rilda Canyon Facilities are located in an area previously disturbed by coal mining activities (refer to R645-301-400 Map 4-1).

Underground access to the North Rilda Canyon Portal Facilities will be achieved by developing a set of three entry submains driven east from the 1st Right Submains to the coal outcrop near the location of the reclaimed Leroy Mine (aka Comfort Mine). All of the development will occur in the Hiawatha coal seam. During the development of the North Rilda Canyon Portal Facilities two separate surface breakouts will be constructed; 1) Mine Fan, and 2) Intake Rock Slope (refer to R645-301-500 Engineering Section). Mine Fan portal will be developed in the Hiawatha seam, located above the mine facilities. Due to the elevation relief from the coal outcrop to the valley floor, Energy West will developed a rock slope through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in 1st Right Submains.

R645-301-622 CROSS-SECTIONS, MAPS, AND PLANS

Map MFU-1823D (Volume 12 Mill Fork Lease R645-301-600 Geologic Section), the Geologic Formations Map and HM-9 (Volume 9 Hydrology) shows the locations and elevations on the surface of all exploration drillholes and test wells within the North Rilda Area. Twenty-four (24) coal exploration holes and one gas well have been drilled within the North Rilda Area to date (November, 03). All of the drill holes completed were by Energy West from 1978 to 1997.

R645-301-621.200 Nature, Depth, and Thickness of the Coal Seams to Be Mined

Mining operations at PacifiCorp's mines have historically mined the two major seams present in the area, the Blind Canyon (upper) and the Hiawatha (lower) seams. A minor, unsuccessful

attempt to mine the Cottonwood seam (middle) was made in the Wilberg mine, but the seam was too thin. Cottonwood seam mine workings are insignificant in the overall operation. The coal-bearing portion of the Blackhawk formation is the lower half of the formation, with the Hiawatha seam at or just above the interface between the Blackhawk formation and the Star Point Sandstone below.

Both the Hiawatha and Blind Canyon coals are ranked as High-Volatile Bituminous 'B' low sulfur coals.

Remaining coal reserves in the Deer Creek are in both the Hiawatha and Blind Canyon seams. Where as coal reserves in the North Rilda Area are restricted two remaining longwall panels located in the Hiawatha seam. The Hiawatha and Blind Canyon seams are close together, usually within 80 vertical feet. The depths of both seams, therefore, are similar in those areas where both seams are present. Overburden depths (Volume 12 Mill Fork Lease R645-301-600 Geologic Section Maps MFS 1824D & MFS 1825D) range from 0 feet, where both seams outcrop at the surface, up to about 2,600 feet under the Flagstaff Limestone "caps" on East and Trail mountains. The overburden strata consist of those formations already listed in section R645-301-621:

- Flagstaff Limestone
- North Horn Formation
- Upper Price River Formation
- Castlegate Sandstone
- Blackhawk Formation

Localized rider coal seams are fairly common above both seams, occurring from 1 foot to 20 feet or more above the Hiawatha and Blind Canyon seams. None of these rider seams have been named or mined.

In this region of the Wasatch Plateau, the Hiawatha seam is the lowest coal seam present. In much of the mining area currently permitted by PacifiCorp, the Hiawatha seam rests directly on the Star Point Sandstone, a massive, medium-grained, brownish-gray sandstone, which makes a very good mine floor. In some areas, there are between 0 and 15 feet of interbedded softer mudstones and siltstones between the Hiawatha and the Star Point Sandstone.

Thickness of the coal seams is variable, ranging from as little as 0 feet up to 19 feet in the Blind Canyon and from 0 feet up to 19 feet in the Hiawatha. Coal thickness is dependent on two main factors – the amount of peat originally deposited in the Cretaceous swamps, which varies from region to region, and the amount of scouring or erosion of the peat that took place after the peat was deposited but before lithification of the sedimentary sequence. More coal was deposited in

the center of the swamp areas than around the edges, where distributary stream channels either prevented deposition, or scoured away the peat already deposited.

At some point in time during peat swamp development, the environment of deposition changed and each successive peat swamp was overrun by sediments, mainly mudstones and sandstones. Stream beds that passed directly over the previously deposited peats eroded sinuous channels of various depths into the peat and left behind sand-filled "scours," which cut varying amounts of top coal from the original thickness. The sudden losses of coal height that occur under these localized scours have impacts on coal mining operations that range from mild to disastrous.

Regional variations in coal thickness in the Blind Canyon and Hiawatha seams have been documented to varying degrees by mining activities and exploration drilling funded by government agencies and industry. Regional thickness trends of these seams are fairly well known, but the localized thickness variations caused by channeling are not as well known due to the localized nature of channeling.

R645-301-621.300 All Coal Crop Lines of the Coal to Be Mined

Coal outcrop and projected outcrop lines are shown on Map MFU 1823D (**Volume 12 Mill Fork Lease R645-301-600 Geologic Section**). Coal outcrop lines are inferred where the outcrops are concealed by alluvium or colluvium.

Strike and dip of the coal seams are shown on Map MFU 1827D and MFU 1828D (Volume 12 Mill Fork Lease R645-301-600 Geologic Section). The strike of the coal seams varies as the coal beds and surrounding strata are folded by the different structures (Flat Canyon Anticline and Crandall Canyon Syncline) mentioned in the section on structures above. The dip of the coal beds in this area is usually gentle, with dips rarely exceeding 4 or 5 degrees.

R645-301-621.400 Location and Depth of Gas and Oil Wells

No oil & gas exploration activities have occurred within the North Rilda Area.

R645-301-623 ENVIRONMENTAL GEOLOGIC INFORMATION

R645-301-623.100 Acid- and Toxic-Forming Strata

Extensive sampling and testing of overburden strata, coal , and surrounding rocks has shown that there are almost no materials present that are potentially acid- or toxic- forming media. Almost

all samples show slight alkalinity. Yearly sampling of in-mine roof, coal, and floor materials continue to confirm these results. Detailed analyses are presented in Volume 12 Mill Fork Lease R645-301-600 Geologic Section Appendix C.

In addition, Energy West Mining Company drilled two (2) holes within 2nd Right development entries at cross cuts #6 and #10 (refer to Appendix B and Figure GF-3, Figure Tab). As discussed previously, a rock slope will be developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in 1st Right Submains. Excavated material from the slope (sandstone) will be used as a source of potential fill. These holes were drilled through the interval of the projected slope to document acid- and toxic-forming potential of the Upper Member (Spring Canyon) of the Star Point Sandstone. Each hole was sampled on approximately ten (10) foot intervals (refer to Soil Analysis Report in Appendix B). None of the samples were considered acid- and toxic-forming according to the specifications listed DOGM's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining".

R645-301-623.200 Reclamation Potential

With the acquisition of the Mill Fork State Lease 48258, underground operations at the Deer Creek Mine are expanding to the northeast. To improve overall transportation and economic considerations additional surface facilities are required in Rilda Canyon. This includes all support facilities for underground mining operations except coal transportation.

Surface facilities in Rilda Canyon includes the existing mine fan in the Left Fork of the canyon, and surface related facilities associated with the proposed North Rilda Canyon Portal Facilities including; bathhouse/office/warehouse, underground vehicle parking garage, fuel dock, water and sewer stations, rock dust silo, employee parking area, fan, sediment pond, covered and open storage area, etc. The proposed North Rilda Canyon Portal surface facilities are located approximately 160 feet below the Hiawatha Seam. To access the seam from this location, a 2000 foot rock slope is proposed to be constructed through the Star Point Sandstone. Refer to Section R645-301-521 for a detailed description of all proposed surface facilities planned for the North Rilda Canyon access to the Mill Fork Lease. Also refer to Volume 12 of the Deer Creek MRP for detailed information of the mining plan, mining production, and mining methods that will be utilized within the Mill Fork Lease.

Early mining operations occurred near the proposed surface facilities (refer to Map 4-1). These operations include the Romminger (Ferrell) Mine, Jeppson Mine, Leroy Mine (Comfort), and Helco Mine. Mining occurred in these mine in the 1940's and early 1950's. Abandonded Mine Lands (AML) reclaimed these mines in 1988. Much of the proposed disturbed surface area of the

Rilda Canyon facilities will occur within the Leroy, Romminger, and Jeppson mines disturbed area.

R645-301-623.300 Subsidence Control Plan

Surface subsidence of all of the Energy West permit areas has been carefully surveyed, monitored and documented for almost 20 years. Subsidence is monitored by yearly comparison of new verus baseline aerial photography using sophisticated photogrammetric measuring techniques, and is tied to known surveyed control points on the ground. Overflights by helicopter of all mined areas are conducted at least annually to inspect the ground surface. A Subsidence Monitoring Report is published annually, and submitted to various regulatory agencies.

For the purposes of this section and the proposed operations in the North Rilda Area, a subsidence control plan has been developed. Refer to R645-301-525. Engineering for plan details.

R645-301-624 GEOLOGIC INFORMATION

Numerous sedimentary rock formations are exposed in the North Rilda Area on East Mountain both above and below the coal bearing Blackhawk formation. The composition, arrangement, and physical characteristics of these formations greatly affect the mining and hydrologic characteristics of the area.

The geologic formations exposed in the North Rilda Area range from Upper Cretaceous (100 million years old) to Tertiary and Recent in age (refer to Figure GF1 and GF-2, Figure Tab). These formations, in ascending order from oldest to youngest, are the Masuk Shale member of the Mancos Shale, the Star Point Sandstone, the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation, and the lower part of the North Horn Formation (all Cretaceous), the upper part of the North Horn Formation, and Flagstaff Limestone (Tertiary). Recent geologic deposits include numerous stream terrace gravels along streams and rivers, glacial till deposits in the upper reaches of Cottonwood Canyon, and alluvial and colluvial fills in all of the significant drainages and in Joes Valley.

Vertical relief across the exposures of these formations is about 3,000 feet within the permit area. Overburden thickness above the lowest coal seam to be mined (the Hiawatha seam) ranges from about 200 feet up to about 2,600 feet.

This sedimentary sequence has been structurally modified over time only slightly. Three gentle fold structures, the Straight Canyon syncline, Flat Canyon anticline and the Crandall canyon syncline, occur within the PacifiCorp permit area. Dips of the beds are generally very gentle, less than 5 degrees. For detail structure related to the North Rilda Area refer to Volume 12 Mill Fork Lease R645-301-600 Maps Geologic Formations, Blind Canyon Structure Contour and Hiawatha Structure Contour.

Faulting is present within the PacifiCorp permit area. Three graben structures are present within and adjacent to the North Rilda Area, Roans Canyon, Left Fork and the Joes Valley (refer Volume 12 Mill Fork Lease R645-301-600 Maps Geologic Formations for the location of these structures in relationship to the North Rilda Area). In addition, numerous normal faults occur to the south and east of the North Rilda Area. No other faulting is known to exist within the North Rilda Area.

Jointing of the sedimentary formations of the area is a significant and important feature. Jointing of the rocks surrounding the coal seams affects mine orientation and planning, as well as the hydrologic characteristics of the rocks. Joints in the area trend predominantly north – south to N 10° E (parallel to the Joes Valley Fault), with a few secondary sets at other orientations.

Surface and groundwater hydrology has been extensively studied within the permit area and adjacent areas. Surface water originates from melting snow, with a significant runoff season every year. Yearly precipitation has varied widely over the past 20 years, resulting in fluctuations of surface water flows and surface spring discharges.

Alluvial fills in the bottoms of Rilda and Mill Fork canyons have been shown to transport significant quantities of sub-surface water downstream. For a complete discussion of the surface hydrology of Rilda Canyon refer to R645-301-721: Existing Surface Water Resources.

Subsurface water, including water that is intercepted in mine workings, is usually encountered in ancient, perched aquifers. These perched aquifers are usually tabular or stream channel sandstones, which have moderate porosity, but low permeability. Water also is encountered perched in the open joint systems within these rocks. Subsurface water has also been encountered in some isolated incidents in fault zones and structural synclines, notably the Roans Canyon fault zone and Straight Canyon syncline, about mile south of the North Rilda Area.

Extensive research has shown that the surface and underground hydrologic systems are not hydraulically connected. No impact to surface hydrologic systems is anticipated within the permit area. Some perched water will be encountered underground during mining activities

within the permit area. The location and quantity of water encountered underground will depend on the types of rocks, joint patterns and geologic structures that are present.

R645-301-624.200 Overburden Removal
All mining related to the North Rilda Area will be from underground operations. Analyses of overburden materials are presented in Volume 12 R645-301-600 Appendix C and Appendix B of this section.

As discussed earlier, Energy West Mining Company drilled two (2) holes within 2nd Right development entries at cross cuts #6 and #10 (refer to Appendix B and Figure GF-3, Figure Tab). A rock slope will be developed through the upper member of the Star Point Sandstone (Spring Canyon Member) from the portal facility area to an interception point in 1st Right Submains. Excavated material from the slope (sandstone) will be used as a source of potential fill. These holes were drilled throug the interval of the projected slope to document acid- and toxic-forming potential of the Upper Member (Spring Canyon) of the Star Point Sandstone. Each hole was sampled on approximately ten (10) foot intervals (refer to Soil Analysis Report in R645-301-600 Appendix B). None of the samples were considered acid- and toxic-forming according to the specifications listed DOGM's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining".

Surface facilities in Rilda Canyon includes the existing mine fan in the Left Fork of the canyon, and surface related facilities associated with the proposed North Rilda Canyon Portal Facilities including; bathhouse/office/warehouse, underground vehicle parking garage, fuel dock, water and sewer stations, rock dust silo, employee parking area, fan, sediment pond, covered and open storage area, etc. The proposed North Rilda Canyon Portal surface facilities are located approximately 160 feet below the Hiawatha Seam. To access the seam from this location, a 2000 foot rock slope is proposed to be constructed through the Star Point Sandstone. Refer to Section R645-301-521 for a detailed description of all proposed surface facilities planned for the North Rilda Canyon access to the Mill Fork Lease and R645-301-200 Soils Section for a complete discussion related to the soil survey and analysis for the proposed disturbed area. Also refer to R645-301-500 Engineering Section for detailed information of the mining plan, mining production, and mining methods that will be utilized within the North Rilda Area and Volume 12 of the Deer Creek MRP for the Mill Fork Lease.

R645-301-624.230 Chemical Analyses of the Coal Seam for Acid- and Toxic- Forming Materials

Chemical analyses for the Blind Canyon and Hiawatha coal seams within the permit area are available from drill cores from Energy West drill holes and run-of-mine coal sampling (refer to Volume 8 Geology and Volume 12 Mill Fork Lease R645-301-600 Appendix A).

R645-301-624.310 Drill Hole Logs

R645-301-600 Appendix A contains a tabulation of all drill hole logs within the permit area. All drill hole logs are available for review at Energy West Mining's main office in Huntington, including the proprietary holes completed by PacifiCorp.

R645-301-624.320 Chemical Analyses for Acid- or Toxic- Forming Materials

Refer to Volume 12 Mill Fork Lease R645-301-600 Appendix C contains a table of analyses for acid- and toxic- forming or alkalinity-producing materials above and below the coal seams to be mined. Appendix B of this volume includes acid- and toxic- forming or alkalinity-producing materials related to the Upper Member of the Star Point Sandstone.

R645-301-624.330 Pyritic and Total Sulfur Chemical Analyses

Sulfur forms data for the Blind Canyon and Hiawatha coal seams within the East Mountain permit area are available from drill cores and run-of-mine coal samples. Total sulfur content averages approximately 0.5% and generally ranges from 0.48% to 0.59%. Of this sulfur content, 79% is in the form of organic sulfur and 16% is in the form of pyritic including marcasite; the remainder is in the form of sulfate (refer to Volume 8 Geology and Volume 12 Mill Fork Lease R645-301-624.230).

R645-301-627 DESCRIPTION OF OVERBURDEN

Overburden above the lowest seam to be mined (the Hiawatha Seam) is shown Figure GF-1, GF-2 (Figure Tab), Map MFU 1829D, Geologic Cross-Sections (Volume 12 Mill Fork Lease) and Volume 8. The overburden above the coal seams to be mined includes the Blackhawk Formation, the Castlegate Sandstone, the Upper Price River Formation, the North Horn Formation and Flagstaff Limestone.

The Blackhawk formation consists of interbedded fluvial mudstones, siltstones, sandstones and coals. The vertical makeup of this formation is highly variable. Generally, the Blackhawk is

sandier toward the top, and shalier toward the bottom. The mineable coal seams are usually within the bottom 300 feet of the formation, along with numerous rider seams and carbonaceous mudstones. This formation usually forms a long, steep slope (about 40 degrees) with frequent outcrops of large channel sandstones. The Blackhawk formation ranges from 600 to 800 feet thick in the permit area.

The Castlegate Sandstone, which comprises the lower half of the Price River formation, is a prominent cliff-forming sandstone, which forms cliffs or steep blocky outcrops which are visible nearly everywhere in the permit area. The Castlegate is a massive, coarse grained, occasionally conglomeratic or arkosic sandstone. The prominent North – South joint set is usually clearly visible in outcrops of the Castlegate. The Castlegate Sandstone averages about 300 feet thick in the permit area.

The Upper Price River formation consists of interbedded coarse-grained sandstones that resemble those of the Castlegate Sandstone, but are softer, and interbedded with occasional mudstones. The Upper Price River formation forms a steep slope above the Castlegate Sandstone cliffs. The thickness of the Upper Price River formation is difficult to determine, due to its gradational contact with the overlying North Horn formation, but is probably about 600 feet thick in the permit area.

The contact between the Upper Price River formation and the North Horn formation is difficult to discern on East Mountain, but is generally picked as the change in slope from the steeper outcrops of the Upper Price River formation below to the gentler and more rolling slopes of the North Horn formation above.

The North Horn formation is a softer formation which forms the rolling, slumping, hummocky terrain near the top of East Mountain. The North Horn consists mostly of interbedded shales and clays, with occasional sandstone and fresh water limestone beds. The North Horn formation has a characteristic orange to reddish purple color. Outcrops of the North Horn formation are rare, and usually seen on very steep eroded slopes or in landslide areas. The North Horn formation is about 800 – 1,000 feet thick in the permit area.

The Flagstaff Limestone forms isolated "caps" on the highest peaks of East Mountain to the west of the North Rilda Area. The Flagstaff Limestone is a fresh water lacustrine limestone which is about 100 to 200 feet thick. This limestone is hard and resistant.

In terms of potential subsidence, this combination of hard and soft formations has a beneficial effect. The Castlegate Sandstone is generally considered a barrier to subsidence. It is so thick and massive that in some places such as Trail Mountain, the Castlegate essentially prevents

subsidence cracking from reaching the surface. No surface cracks have been detected on Trail Mountain. The softer formations above the Castlegate have a tendency to move and settle without major cracking due to their softer nature.

Most of the surface cracking in the Deer Creek mine area has occurred in shallow cover areas of Blackhawk Formation exposures, or along the edges of groups of longwall panels.

Because the Castlegate Sandstone is a prominent cliff-former, subsidence damage to the formations overlying the mines is concentrated in the Castlegate. This damage takes place when undermining causes vertical and overhanging cliff faces and balanced rocks to fail. Cliff failures of this type have been isolated to Newberry Canyon and Corncob Wash above the Cottonwood mine, and a section of cliff above the Trail Mountain Mine, and represent a fraction of the total amount of Castlegate Sandstone cliffs undermined. Minor rock falls above the Deer Creek Mine on the south side of Rilda Canyon have also been documented. Energy West is currently involved in an extensive study of the effects of subsidence on the Castlegate sandstone cliffs on the north side of Rilda Canyon. The results of this study will determine the effectiveness of the empirical model developed and used to predict the likelihood of cliff failure.

R645-301-630 OPERATION PLAN

The permit area contains areas of mineable coal in both the Blind Canyon and Hiawatha seams.

Mine Plan: Access to the North Rilda reserves was achieved with the use of 5-entry set of mains referred to as 4th North Mains. The 4th North Mains are developed northwest (approximately 4000 feet) from the 4th North / 10th West Mains intersection. Mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 Hydrology Maps HM-9, HM-10 and HM-12). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the bedrock interface. Based upon the results of the surface exploration program, mining below the Right Fork of Rilda Canyon was re-located approximately 800 feet to the west of the original projection. Re-location of the mains to the west increased the overburden from approximately 120 to 200 feet.

Based on the information gained from the surface exploration program , a detailed plan was developed to position the 4th North/5th North intersection to optimize the "no-subsidence" design of the 5th North / Rilda Canyon Right Fork crossing route and rock slope access into the lower Hiawatha Seam as well as maximizing overall reserve recovery within the area.

From the 4th North/5th North intersection, mainline development will proceed to the northern boundary of Federal Coal Lease U-024317. Longwall gateroad development sections will be driven due east from the 5th North Mains to the extent of mineable reserves. Six longwall panels were completed in the Blind Canyon Seam, and six longwall panels are projected in the Hiawatha Seam.

Hiawatha Seam Access: Access to the to North Rilda Hiawatha seam reserves was achieved with development of rock slopes and vertical shafts from the Blind Canyon seam to the lower seam. From the bottom of the slopes, a 5-entry set of mains referred to as 6th North Mains were developed to the northeast for access to gateroad development in the Hiawatha seam. Main line development was reduced to three entries above 6th Right.

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 5-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed (refer to R645-301-500 Map DU1688 in Appendix 1).

North Rilda Canyon Portal Facility Access: Based on data acquired through in-mine directional drilling program, Energy West developed a mine plan to access the North Rilda Canyon Portal Facility area with a set of three entry submains referred to as 1st Right, driven east from the 1st South submains to the Hiawatha coal outcrop near the reclaimed Leroy Mine portals. A fan portal will be constructed at this location. In addition, intake and travel access to the mine will be accomplished by constructing a portal and rock slope from the surface. The slope will be constructed at the elevation of the mine facilities pad and sloped upward at 8% for approximately 2100 feet to the Hiawatha coal seam. The dimensions of the portal will be a 20' x 9' foot rectangular opening. Mine equipment and men will use this portal to access the northern part of the Deer Creek Mine.

R645-301-631 CASING AND SEALING OF BOREHOLES

Each coal exploration permit application will include a description of the methods used to backfill, plug, case, cap, seal or otherwise manage exploration holes or boreholes to prevent acid

or toxic drainage from entering water resources, minimize disturbance to the livestock, fish and wildlife, and machinery in the permit and adjacent area. Each exploration hole or borehole that is uncovered or exposed by coal mining and reclamation operations within the permit area will be permanently closed, unless approved for water monitoring or otherwise managed in a manner approved by the Division. Use of an exploration borehole as a water monitoring or water well must meet the provisions of R645-301-731. The requirements of R645-301-731.400 do not apply to boreholes drilled for the purposes of blasting.

Exploration boreholes are plugged after use by filling the hole from total depth to the surface with type II portland cement. If circulation cannot be maintained within the borehole, enough cement to fill the borehole completely is pumped to the bottom of the hole, then the remainder of the hole is filled with bentonite chips or pellets to within the top 5' of the hole, and a cement surface plug containing a permanent hole identification marker is placed in the top of the hole. This hole plugging method is approved by the BLM and DOGM, and is used on all present and future exploration boreholes.

If an exploration borehole is to be converted to a water monitoring well, the water well regulations of the State of Utah are used to construct the well completion.

R645-301-632 SUBSIDENCE MONITORING

All mining within the permit area will be underneath the uninhabited North Rilda Area of East Mountain. No dwellings or building structures or roads will be undermined.

One power transmission line is present within the North Rilda area. This transmission line is owned and operated by Utah Power, a subsidiary of PacifiCorp. The transmission line (25 KV) was constructed parallel to the Emery County Road #306 and transmits electricity from the Huntington Canyon mainline to the Left Fork facilities.

The method used to detect and document subsidence on East Mountain divides the land surface into separate study areas based on the second-mining areas in the mine plan. These areas are then studied using photogrammetric comparisons of each successive year of mining progress. The photogrammetry is tied to known survey baseline points that are flagged each year.

R645-301-641 SEALING OF BOREHOLES

All exploration boreholes are sealed upon completion using the following method. The borehole is filled with cement/abandonite from bottom to top through the drill pipe or other pipe lowered

into the hole. As much cement/abandonite is used to fill the hole, or if the hole does not fill, enough cement/abandonite to fill the hole plus 10% is pumped through the pipe into the hole. If the hole does not fill to the surface, the remainder of the hole is filled with bentonite chips to within 5' of the surface. A cement surface plug is placed in the hole, and a brass marker with the hole number and year is placed on top of the cement, two feet below surface grade (refer to R645-301-600: Appendix A for exploration drillhole Table 1, Existing Exploration Drillhole Completion Details).

Regulatory oversight authority for the various phases of exploration drilling and data analysis is delegated as follows:

a.	Determine if mineable coal reserves are present	BLM
b.	NEPA analysis	BLM/Surface Management Agency (SMA), DOGM comment on reclamation
c.	Exploration license or drill permit approval	BLM with SMA concurrence
d.	Inspections	BLM, SMA, DOGM (shared resources)
e.	Enforcement	BLM, SMA, DOGM with SMA cooperation
f.	Appeals	BLM, SMA, and/or DOGM

Additionally, over 500 holes have been drilled from within the mines of the area, all provide information about the geology of the area. Finally, coal seams exposed by outcrops and within the mine workings have been mapped in detail, providing data and knowledge of the geology in the area.

R645-301-600 GEOLOGY SECTION

FIGURES

♦ FIGURE GF-1: STRATIGRAPHY OF EAST MOUNTAIN

♦ FIGURE GF-2: NORTH RILDA AREA - GEOLOGY OF THE RILDA CANYON PORTAL FACILITIES

♦FIGURE GF-3: LOCATION OF STAR POINT SANDSTONE DRILL HOLES

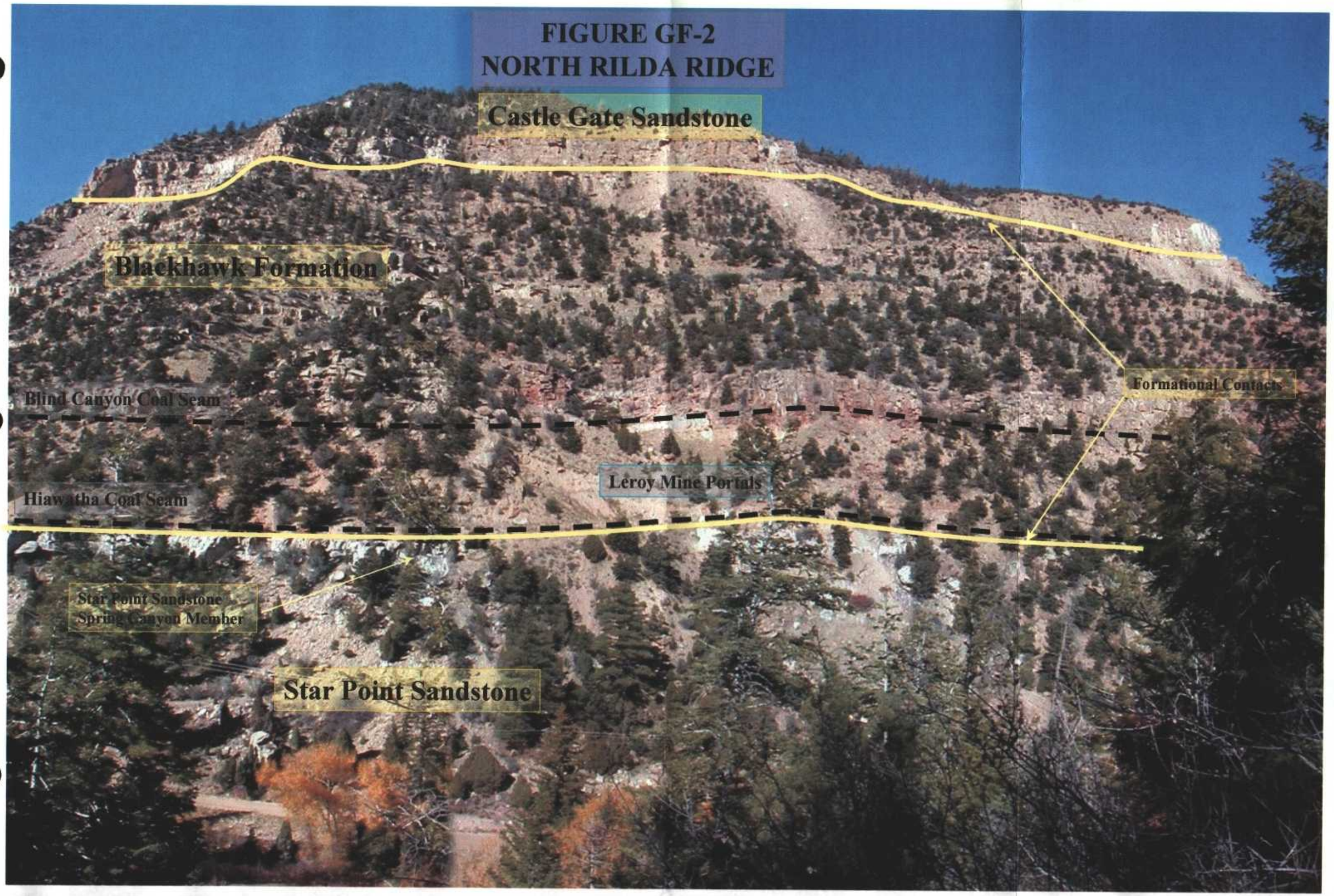
Figure GF-1

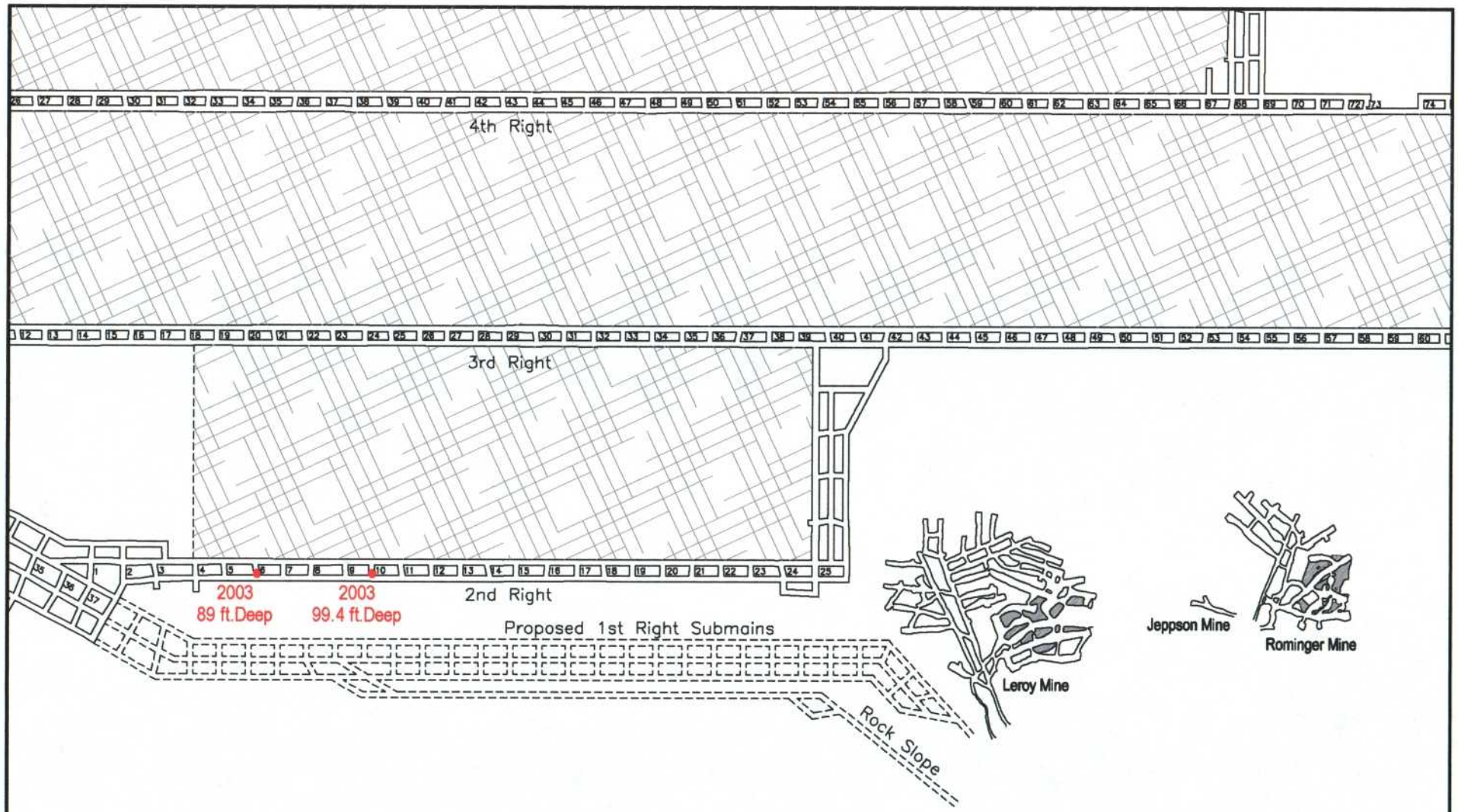
Stratigraphy of East Mountain

(After Doelling, 1972)

Period	Epoch/Age	Stratigraphic Unit		Thickness, feet	Description
QUAT.	Holocene (Recent)		Alluvium	0 - 200'	Valley fills, poorly sorted clay to boulders
	Paleocene	Wasatch Group	Flagstaff Limestone	100 - 200	Fossiliferous lacustrine limestone, gray
			North Horn Formation	500 - 1500	Variegated mudstones and clays, occasional sandstones & limestones, forms hummocky terrain.
CRETACEOUS	Maastrichtian				
		Mesaverde Group	Upper Price River Formation	600 - 800	Coarse-grained sandstones, occasional conglomerates, interbedded mudstones
	Campanian		Castlegate Sandstone (lower Price River Formation)	200 - 400	Coarse grained sandstone, occasional conglomerate lenses, tan color, massive cliff-former
			Blackhawk Formation	600 - 800	Interbedded mudstones, siltstones, and sandstones, bottom 150 feet contains coal seams and rider seams.
			Star Point Sandstone: Spring Canyon tongue Storrs tongue Panther tongue	200 - 400	Sandstone, gray-white, 3 main units inter- tongue with underlying Masuk Shale, tops of units occasionally bleached white, indicating overlying coal seams.
	Santonian	Mancos Shale	Masuk Shale Member	1,000 - 1,300	Shale, gray, soft, slope former
			Emery Sandstone	50 - 800	Sandstone, yellow-gray, cliff-former. May be associated with coal seams. Subsurface only in Mill Fork Lease.
	Coniacian		Blue Gate Shale Member	1,500 - 2,400	Shale, blue-gray, nodular, irregularly bedded, forms badlands. Subsurface only in Mill Fork Lease.
	Turonian		Ferron Sandstone Member	50 - 950	Sandstone, yellow-gray, intertongues with Mancos shale, associated with important coal beds of Emery coal field, source of coal bed methane.

FIGURE GF-2
NORTH RILDA RIDGE





• STARPOINT SANDSTONE DRILLHOLE SAMPLE LOCATION

CAD FILE NAME/DISK#: DU1879A.DWG

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

DEER CREEK MINE
RILDA CANYON
LOCATION OF STARPOINT SANDSTONE SAMPLES

DRAWN BY:	K. LARSEN	FIGURE GF-3	
SCALE:	1" =500'	DRAWING #:	
DATE:	OCTOBER 30, 2003	SHEET 1 OF 1	REV. ___

R645-301-600 GEOLOGY SECTION

APPENDIX A

♦NORTH RILDA AREA EXPLORATION DRILLING AND ABANDONMENT

R645-301-600
APPENDIX A

North Rilda Permit Area
Existing Exploration Drillhole Completion Details

Hole No.	Completion Date	Total Depth (feet)	Hole Diameter	Completion Details
EM-47	10/08/1978	300	6"	Completed as monitoring well; casing perforated 210 - 270 foot depth
EM-48	08/27/1979	1860	6"	Plugged with 335 sacks of cement
EM-49	09/29/1979	1680	6"	Plugged with 306 sacks of cement
EM-56c	11/11/1979	422	6", $4^7/_8$"	Plugged with 76 sacks of cement
EM-52	07/30/1986	1560	6"	Plugged with 289 sacks of cement
EM-51	08/01/1986	1660	6", $5^5/_8$"	Plugged with 300 sacks of cement
EM-50	08/03/1986	1680	6", $5^5/_8$"	Plugged with 300 sacks of cement
EM-55	08/04/1986	1680	6", $5^5/_8$"	Plugged with 300 sacks of cement
EM-105	08/13/1986	1620	6", $5^5/_8$"	Plugged with 300 sacks of cement
EM-53	11/13/1995	716	3", $2^1/_2$"	Plugged with 27 sacks of cement, 3 sacks of bentonite pellets
EM-107	11/20/1995	767	3", $2^1/_2$"	Plugged with 33 sacks of cement
EM-153	09/27/1996	796	3", $2^1/_2$"	Plugged with 33 sacks of cement, Surface plug
EM-154	10/05/1996	795	3", $2^1/_2$"	Plugged with 35 sacks of cement, 17 sacks of bentonite pellets*
EM-155	10/09/1996	716	3", $2^1/_2$"	Plugged with 35 sacks of cement, 17 sacks of bentonite pellets*
EM-156	10/15/1996	755	3", $2^1/_2$"	Plugged with 35 sacks of cement, 16 sacks of bentonite pellets*
EM-157	10/18/1997	436	3", $2^1/_2$"	Plugged with 35 sacks of cement, 6 sacks of bentonite pellets*
EM-158	10/20/1996	227	3", $2^1/_2$"	Plugged with 20 sacks of cement, 1 sack of bentonite pellets*
EM-159	08/23/1997	227	3", $2^1/_2$"	Plugged with 20 sacks of cement, 1.5 sack of bentonite pellets*
EM-160	09/08/1997	257	3", $2^1/_2$"	Plugged with 10.5 sacks of cement, 2 sack of bentonite pellets*
EM-161	09/06/1997	287	3", $2^1/_2$"	Plugged with 15 sacks of cement,
EM-162	09/04/1997	307	3", $2^1/_2$"	Plugged with 16.5 sacks of cement, 0.5 sack of bentonite pellets*
EM-163	08/27/1997	327	3", $2^1/_2$"	Plugged with 12 sacks of cement,
EM-164	08/26/1997	366	3", $2^1/_2$"	Plugged with 28 sacks of cement, 1.5 sack of bentonite pellets*
EM-166	07/14/2000	589	3", $2^1/_2$"	Plugged with 27 sacks of cement, 6 sack of bentonite pellets*

*Cement volume more than adequate to fill hole, but did not, remainder of hole filled to surface with $^3/_8$" bentonite pellets.

R645-301-600 GEOLOGY SECTION

APPENDIX B

♦NORTH RILDA AREA STAR POINT SANDSTONE
ACID- AND TOXIC-FORMING ANALYSIS
STAR POINT SANDSTONE DRILL LOGS

Inter-Mount Laboratories, Inc.

Report ID: 010314939

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR
		s.u.	%	mmhos/cm	meq/L	meq/L	meq/L	
0103S14939	XC-6	7.3	30.8	0.48	1.64	1.35	0.94	0.77
0103S14940	XC-6	7.3	29.8	2.63	24.4	11.7	1.11	0.26
0103S14941	XC-6	7.3	29.1	1.69	9.99	9.26	0.99	0.32
0103S14942	XC-6	7.4	27.9	1.90	11.4	10.7	1.20	0.36
0103S14943	XC-6	7.5	24.7	1.55	7.01	9.13	1.53	0.54
0103S14944	XC-6	7.3	26.8	2.30	13.4	13.5	1.32	0.36
0103S14945	XC-6	7.2	25.1	3.20	21.4	19.9	1.49	0.33
0103S14946	XC-6	7.2	27.7	3.17	24.1	17.6	1.21	0.26
0103S14947	XC-6	7.0	25.1	3.31	25.3	19.6	1.31	0.28
0103S14948	XC-10	7.6	28.5	0.37	1.00	0.63	1.25	1.39
0103S14949	XC-10	7.6	30.6	0.26	0.54	0.43	0.85	1.22
0103S14950	XC-10	7.7	30.2	0.32	0.87	0.93	0.73	0.77
0103S14951	XC-10	7.7	28.5	0.67	1.94	3.28	0.93	0.57
0103S14952	XC-10	7.1	26.2	2.78	19.3	16.2	1.25	0.30
0103S14953	XC-10	7.5	28.8	1.35	5.67	7.40	1.03	0.40
0103S14954	XC-10	7.5	25.4	1.87	8.79	12.4	1.25	0.38
0103S14955	XC-10	7.4	27.4	1.85	9.49	11.1	1.23	0.38
0103S14956	XC-10	7.0	25.6	3.37	24.7	20.3	1.23	0.26
0103S14957	XC-10	7.2	22.7	2.50	15.8	14.6	1.26	0.32

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mount Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

Report ID: 010314939

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	Coarse Fragments %	Sand %	Silt %	Clay %	Texture	1/3 Bar %	15 Bar %
0103S14939	XC-6	23.5	84.0	6.0	10.0	LOAMY SAND	7.8	3.1
0103S14940	XC-6	38.9	82.0	10.0	8.0	LOAMY SAND	9.7	3.7
0103S14941	XC-6	39.3	82.0	10.0	8.0	LOAMY SAND	9.0	3.2
0103S14942	XC-6	49.7	74.0	16.0	10.0	SANDY LOAM	11.9	4.0
0103S14943	XC-6	59.2	68.0	20.0	12.0	SANDY LOAM	12.1	5.0
0103S14944	XC-6	55.3	74.0	15.0	11.0	SANDY LOAM	12.3	4.1
0103S14945	XC-6	58.9	72.0	16.0	12.0	SANDY LOAM	11.5	4.8
0103S14946	XC-6	58.0	74.0	16.0	10.0	SANDY LOAM	12.4	4.9
0103S14947	XC-6	59.3	68.0	19.0	13.0	SANDY LOAM	11.6	5.1
0103S14948	XC-10	59.1	82.5	6.2	11.3	LOAMY SAND	7.4	3.1
0103S14949	XC-10	37.3	84.0	7.0	9.0	LOAMY SAND	11.7	4.6
0103S14950	XC-10	45.8	80.0	10.0	10.0	SANDY LOAM	13.5	5.2
0103S14951	XC-10	52.9	74.0	15.0	11.0	SANDY LOAM	16.6	6.9
0103S14952	XC-10	60.9	70.0	19.0	11.0	SANDY LOAM	16.6	6.5
0103S14953	XC-10	53.0	73.0	17.0	10.0	SANDY LOAM	17.2	6.4
0103S14954	XC-10	62.0	70.0	20.0	10.0	SANDY LOAM	15.7	6.7
0103S14955	XC-10	58.0	72.5	17.5	10.0	SANDY LOAM	14.8	6.0
0103S14956	XC-10	61.6	64.0	22.0	14.0	SANDY LOAM	13.7	7.2
0103S14957	XC-10	67.8	60.0	24.0	16.0	SANDY LOAM	10.4	6.3

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

Report ID: 010314939

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	TOC	Total Sulfur	T.S. AB	Neutral. Pot.	T.S. ABP	TKN	Boron	Nitrogen Nitrate	Selenium
		%	%	t/1000t	t/1000t	t/1000t	%	ppm	ppm	ppm
0103S14939	XC-6	<0.1	0.01	0.31	0.79	0.48	<0.01	0.14	0.62	0.02
0103S14940	XC-6	0.1	0.04	1.25	45.4	44.2	<0.01	0.15	0.74	<0.02
0103S14941	XC-6	<0.1	0.05	1.56	58.5	57.0	0.01	0.10	0.54	<0.02
0103S14942	XC-6	0.1	<0.01	0.00	162	162	0.01	0.12	0.50	<0.02
0103S14943	XC-6	0.7	<0.01	0.00	214	214	0.02	0.15	0.64	0.02
0103S14944	XC-6	0.4	0.02	0.62	197	197	0.01	0.12	0.56	<0.02
0103S14945	XC-6	0.9	0.30	9.37	178	168	0.03	0.19	0.64	0.02
0103S14946	XC-6	0.3	0.15	4.69	113	109	0.01	0.17	0.50	<0.02
0103S14947	XC-6	0.5	0.21	6.56	127	120	0.02	0.22	0.74	<0.02
0103S14948	XC-10	0.1	<0.01	0.00	1.16	1.16	<0.01	0.14	0.60	<0.02
0103S14949	XC-10	<0.1	<0.01	0.00	2.43	2.43	0.01	0.13	0.32	<0.02
0103S14950	XC-10	<0.1	0.01	0.31	54.7	54.4	0.01	0.16	1.18	<0.02
0103S14951	XC-10	0.1	0.03	0.94	135	134	0.01	0.17	0.64	<0.02
0103S14952	XC-10	0.2	0.19	5.94	171	165	0.01	0.12	0.60	<0.02
0103S14953	XC-10	<0.1	0.03	0.94	124	123	0.01	0.13	0.56	0.02
0103S14954	XC-10	0.3	0.05	1.56	221	219	0.01	0.13	1.04	<0.02
0103S14955	XC-10	0.8	0.07	2.19	138	136	0.01	0.13	0.82	<0.02
0103S14956	XC-10	0.7	0.63	19.7	123	103	0.02	0.18	1.08	0.02
0103S14957	XC-10	1.1	0.16	5.00	163	158	0.03	0.22	0.78	0.04

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mount Laboratories, Inc.

Report ID: 010314939

1633 Terra Avenue
Sheridan, WY 82801

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	pH	Saturation	EC @ 25°C	Calcium	Magnesium	Sodium	SAR
		s.u.	%	mmhos/cm	meq/L	meq/L	meq/L	
0103S14948	XC-10	7.6	28.5	0.37	1.00	0.63	1.25	1.39
0103S14948D	XC-10	7.6	29.6	0.32	0.73	0.74	0.95	1.11
0103S14955	XC-10	7.4	27.4	1.85	9.49	11.1	1.23	0.38
0103S14955D	XC-10	7.4	26.8	1.83	9.10	11.0	1.18	0.37

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

Report ID: 010314939

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	Coarse Fragments %	Sand %	Silt %	Clay %	Texture	1/3 Bar %	15 Bar %
0103S14948	XC-10	59.1	82.5	6.2	11.3	LOAMY SAND	7.4	3.1
0103S14948D	XC-10		82.5	7.5	10.0	LOAMY SAND		
0103S14955	XC-10	58.0	72.5	17.5	10.0	SANDY LOAM	14.8	6.0
0103S14955D	XC-10		72.5	17.5	10.0	SANDY LOAM		

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

Inter-Mount Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

Report ID: 010314939

Soil Analysis Report

Energy West Mining Co.
P.O. Box 310
Huntington, UT 84528

Client Project ID: Deer Creek Mine
Date Received: 09/26/03

Set #0103S14939
Report Date: 10/13/03

Lab Id	Sample Id	TOC	Total Sulfur	T.S. AB	Neutral. Pot.	T.S. ABP	TKN	Boron	Nitrogen Nitrate	Selenium
		%	%	t/1000t	t/1000t	t/1000t	%	ppm	ppm	ppm
0103S14948	XC-10	0.1	<0.01	0.00	1.16	1.16	<0.01	0.14	0.60	<0.02
0103S14948D	XC-10	<0.1	<0.01	0.00	1.29	1.29	0.01	0.13	0.48	<0.02
0103S14955	XC-10	0.8	0.07	2.19	138	136	0.01	0.13	0.82	<0.02
0103S14955D	XC-10	0.8	0.07	2.19	139	137	0.01	0.12	0.66	<0.02

Lab ID	Sample ID	Interval (feet)	Lab ID	Sample ID	Interval (feet)
0103S14939	XC-6	3.1-5.1	0103S14948	XC-10	3.3-5.3
0103S14940	XC-6	13.1-15.1	0103S14949	XC-10	13.3-15.3
0103S14941	XC-6	23.1-25.1	0103S14950	XC-10	23.4-25.4
0103S14942	XC-6	33.1-35.1	0103S14951	XC-10	33.4-35.4
0103S14943	XC-6	43.0-45.0	0103S14952	XC-10	43.4-45.4
0103S14944	XC-6	53.1-55.1	0103S14953	XC-10	53.4-55.4
0103S14945	XC-6	63.0-6.0	0103S14954	XC-10	63.4-65.4
0103S14946	XC-6	73.1-75.1	0103S14955	XC-10	73.4-75.4
0103S14947	XC-6	83.1-85.1	0103S14956	XC-10	83.4-85.4
			0103S14957	XC-10	93.3-95.3

These results only apply to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed By: _____
Joey Sheeley, Soils Lab Supervisor

N.: [illegible]

E.: 2,098,079

COAL LITHOLOGIC LOG
ENERGY WEST MINING COMPANY

PROJECT: 2ND RIGHT STAR POINT SAMPLE HOLES DRILL HOLE: 2R SP 1

LOCATION: 2ND RIGHT XC-10 INTAKE
COLLAR ELEV.: 7,725.8'
HOLE TYPE: AX CORE
PLUG INTERVAL: —
CORE INTERVAL: 0-99.4
TOTAL DEPTH: 99.4
DATE: 9/5/03 - 9/6/03
SCALE: 1" = 10'
GEOLOGIST: K.S. FLECK

GEOPHYSICAL DATA		
LOG	FROM	TO
DENSITY:		
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:		
SEAM	THICKNESS	INT.

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
0			COAL		MINE FLOOR 0-2.3 COAL, HIAWATHA SEAM	39.8				
					2.3-3.4 SANDSTONE, LT. BROWN ROOTED, BLOTCHY F.G.	59		1	95	
					3.4-9.9 SANDSTONE LT. BROWN MASSIVE, BECOMES GRAYER BELOW F.G. VERT FRAC 3.3-4.4	100	1	4.4 2 9.4	100	3.3-5.3
10					9.9-16.2 SANDSTONE F.G., OCC. CARBY X.BEDS, GRAYISH BROWN SAP. TEXTURE	100	2	3 14.4	100	13.3-15.3
					16.2-17.1 SANDSTONE F.G., A.B., BUT V. SLIGHTLY WEATH.	100		4	100	
					17.1-17.6 SANDSTONE VFG, MASSIVE WEATH.	100				
					17.6-19.2 SANDSTONE F.G., OCC CARBY X-BEDS, GRAYISH-BUFF. SL. WEATH.	100	19.4	19.4		
20					SANDSTONE, F.G., V. CARBY INTERVAL. 19.2-19.3	0				
					19.3-24.9 SANDSTONE F.G. OCC CARBY V-BEDS, GRAYISH BUFF, SL. WEATH	100	3	5 29.4	100	23.4-25.4
					24.9-28.5 SANDSTONE VFG., ABDT WORM BURROWS, SL. WEATH.	100		6	100	
					28.5-29.1 SANDSTONE VFG, W/ABDT CARB LAMS WEATH	0	29.4	29.4		
30					29.1-37.3 SANDSTONE, F.G., ROOTED & BURROWED, SL. WEATH DOWN TO 35.3	100	4	7 34.4	100	33.4-35.3
								8	100	
					37.3-47.4 SANDSTONE, F.G., MASSIVE, GRAY MINOR CLASTS & BURROWS NEAR BOTTOM.	92.7	39.4	39.4		
40							5	9 44.4	100	43.4-45.4
					47.4-49.4 INTERBEDS SANDSTONE/SILTSTONE/MUDSTONE, FINELY LAMINATED, BURROWED	60	49.4	10 49.4	100	
50					49.4-65.8 SANDSTONE, F.G., FAINT CARB BEDDING, OCC BURROWS NOT WEATHERED COOL WORM BURROW @ 59.8	100	6	11 54.4	100	53.4-55.4
								12 59.4	100	
60							7	13 64.4	100	63.4-65.4
					65.8-66.6 INTERBEDS, SANDSTONE/MUDSTONE, BURROWED	62.5		14	100	
					66.6-70.4 SANDSTONE, F.G., FAINT BEDDING, OCC. BURROWS	97.3	69.4	69.4		
70										

COAL LITHOLOGIC LOG
ENERGY WEST MINING COMPANY

PROJECT: _____
DRILL HOLE: ZR SP 1
PAGE 2 OF 2

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
70					70.4-70.9 INTERBEDS, SANDSTONE/MUDSTONE, BURROWED.	0				
					70.9-75.9 SANDSTONE, VFG., MASSIVE, OCC. BURROWS	100	8	15 / 74.4	100	73.9-75.4
					75.9-81.5 SANDSTONE VFG, FAINTLY BEDDED, BURROWED, SL. DARKER THAN ABOVE	100	79.4	16 / 79.4	100	
80					81.5-99.4 INTERBEDS, SANDSTONE/MUDSTONE, BURROWED.	0.8	9	17 / 84.4	100	83.3-85.3
							89.4	18 / 89.4	100	
90						0.5 92.7	10	19	100	93.3-95.3
							99.4	20 / 99.4	100	
100			T.D.							

N.: [illegible]

E.: 2,097,687

COAL LITHOLOGIC LOG
ENERGY WEST MINING COMPANY

PROJECT: 2ND RIGHT STAR POINT SAMPLE HOLES DRILL HOLE: 2R SP 2

LOCATION: 2ND RIGHT XC-6 INTAKE
COLLAR ELEV.: 7,741.8
HOLE TYPE: AX CORE
PLUG INTERVAL: —
CORE INTERVAL: 0-
TOTAL DEPTH:
DATE: 9/6/03 - 9/7/03
SCALE: 1" = 10'
GEOLOGIST: K.S. FLECK

GEOPHYSICAL DATA		
LOG	FROM	TO
DENSITY:		
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:		
SEAM	THICKNESS	INT.

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
0			COAL		MINE FLOOR 0-2.7' COAL, HIAWATHA, BROKEN UP	0		1	100	
					2.7'-3.1' MUDSTONE, SOFT, SANDY BROWN	0	1	4.1		3.1-5.1
					3.1-9.5 SANDSTONE, F.G., LT BROWN, MASSIVE, FADES DOWNWARD TO GRAY	100	2.1	2 9.1	100	
10					9.5-18.3 SANDSTONE, F.G., CARBY X-BEDS 80 CC. LAMS, SLIGHTLY WEATHERED IN SPOTS	100	2 19.1	3 14.1 4 19.1	100 100	13.1-15.1
20					18.3-27.1 SANDSTONE, A.A., WEATHERING ENDS @ 22.4, BURROWS BOTTOM 2'	99.5	3 29.1	5 24.1 6 29.1	100 100	25.1-29.1
					27.1-27.7 INTERBEDS, MUDSTONE/SANDSTONE, MINOR BIOTURB	58.3				
30					27.7-40.6 SANDSTONE F.G., GRAY & WHITE, X-BEDDED.	99.2	4 39.1	7 34.1 8 39.1	100 100	33.1-35.1
40					40.6-44.2 SANDSTONE, V.F.G., W/OCC. MS INT, ADDT BURROWS & BIOTURB. SMI INCIDENT X. FRAC	83.3	5 49.1	9 44.1	100	43.0-45.0
					44.2-54.7 SANDSTONE, F.G., GRAY, W/OCC. BURROWS, FAINT X-BEDS	99.0		10 49.1	100	
50								11 59.1	100	53.1-55.1
					54.7-63.8 SANDSTONE, F.G., GRAY, W/ ISOLATED MS INT. + LAMS.	97.8	6 59.1	12 59.1	100	
60								13 64.1	100	63.0-65.0
					63.8-64.6 INTERBEDS, MUDSTONE/SANDSTONE BIOTURB	62.5	7			
					64.6-67.3 SANDSTONE, F.G., MASSIVE, FAINT X-BEDS	100		14 69.1	100	
					67.3-68.5 INTERBEDS, MUDSTONE/SANDSTONE, BIOTURB	83	69.1			
70					68.5-72.5 SANDSTONE, F.G., MASSIVE					

COAL LITHOLOGIC LOG
ENERGY WEST MINING COMPANY

PROJECT: _____
DRILL HOLE: 2R SP 2
PAGE 2 OF 2

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
70						100		15	100	
					72.5-77.5 SANDSTONE, F.G., MASSIVE, CRAT. HEDT WORM BIOKROWS	100	8	74.1		73.1-75.1
								16	100	
					77.5-82.5 SANDSTONE, F.G., MASSIVE, OCC. LAMIS & BIOKROW	100	79.1	79.1		
80								17	100	
					82.5-89.1 SANDSTONE F.G., W/OCC MUDSTONE INTERLAMS THAT ARE INTENSELY BIOTURB.	92.4	9	84.1		85.1-85.1
									100	
			T.D.				89.1	89.1		
90										

R645-301-700 HYDROLOGY SECTION

TABLE OF CONTENTS

R645-301-710 **INTRODUCTION** 1
R645-301-711 **GENERAL REQUIREMENTS** 1
R645-301-712 **CERTIFICATION** 1
R645-301-713 **INSPECTION** 2
R645-301-720 **ENVIRONMENTAL DESCRIPTION** 2
R645-301-721 **GENERAL REQUIREMENTS** 2
A. EXISTING GROUNDWATER RESOURCES 2
1. REGIONAL AND PERMIT AREA GROUNDWATER HYDROLOGY 2
2. REGIONAL AND PERMIT AREA GEOLOGY 3
3. REGIONAL AND PERMIT AREA GROUNDWATER CHARACTERISTICS 5
Structural Hydrologic Features 8
Alluvial Aquifers 8
4. SPRINGS AND SEEPS 9
5. GROUNDWATER QUALITY 10
7. GROUNDWATER RIGHTS AND USERS 12
8. NORTH EMERY WATER USERS ASSOCIATION (NEWUA) 13
Description of NEWUA Spring Collection System 16
Quantity 16
Aquifer Characteristics 18
Quality 22
Piezometric Surface 23
Groundwater Quantity Based on Pump Test Results 24
B. EXISTING SURFACE RESOURCES 25
1. REGIONAL AND PERMIT AREA SURFACE WATER HYDROLOGY 25
North Rilda Permit Area Watershed Characteristics 27
2. WATER QUALITY AND QUANTITY 27
Huntington Creek Drainage System 27
3. SOIL LOSS AND SEDIMENT YIELD 30
R645-301-723 **SAMPLING AND ANALYSIS** 32
R645-301-724 **BASELINE INFORMATION** 32

Groundwater 32
Surface Water 33
R645-301-724.100 GROUNDWATER INFORMATION 33
R645-301-724.200 SURFACE WATER INFORMATION 33
R645-301-724.300 GEOLOGIC INFORMATION 34
R645-301-724.400 CLIMATOLOGICAL INFORMATION 34
Precipitation 34
Temperatures 34
Winds 35
R645-301-724.600 SURVEY OF RENEWABLE RESOURCES LANDS 35
R645-301-724.700 ALLUVIAL VALLEY FLOORS 35
R645-301-725 BASELINE CUMULATIVE IMPACT AREA INFORMATION . . . 35
R645-301-728 PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION 35
Description of the Mining Operation 36
Geology 36
Mining Methods 36
Surface Water System 36
Hydrologic Balance - Surface Water System 37

Mitigation and Control Plans 39
Surface Monitoring Plan 39
Groundwater System 40
Hydrologic Balance - Groundwater 41
A. SUBSIDENCE: PERCHED AQUIFER SYSTEMS ABOVE THE MINE HORIZON 41
B. MINING IN THE RILDA CANYON AREA-NEWUA SPRINGS 42
Groundwater Quantity Based on Pump Test Results 44
Wellhead/Drinking Water Source Protection 46
Spring Impacts 47
Mitigation 48
C. INTERCEPTION OF GROUNDWATER BY MINE WORKINGS 49
D. MINING BELOW the RIGHT FORK of RILDA CANYON 50
E. MILL FORK STATE LEASE ML-48258 ACCESS (HIAWATHA SEAM) 51
Depletion of Storage 54
1. *Fluvial Sandstone Channel Systems* 54

2. *Faults and Fractures* 55
3. *Structural Low Areas* 56
Quality 56
Post Mining 57
R645-301-729 CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA) 57
R645-301-730 OPERATION PLAN 57
R645-301-731 GENERAL REQUIREMENTS 57
R645-731-100 HYDROLOGIC BALANCE PROTECTION 58
R645-731.110-112 Groundwater Protection 58
R645-731-120-122 Surface Water Protection 58
R645-301-731.200 WATER MONITORING 58
Groundwater 58
Surface Water 60
R645-301-731.300 ACID AND TOXIC-FORMING MATERIALS 60
R645-301-731.400 TRANSFER OF WELLS 61
R645-301-731.500 DISCHARGES 61
R645-301-731.511 DISCHARGES INTO AN UNDERGROUND MINE 61
R645-301-731.520 GRAVITY DISCHARGES FROM UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES 62
R645-301-731.521 SURFACE ENTRIES AND ACCESSES TO UNDERGROUND WORKINGS 62
R645-301-731.530 STATE-APPROPRIATED WATER SUPPLY 62
R645-301-731.600 STREAM BUFFER ZONES 63
R645-301-731.700 CROSS SECTION AND MAPS 64
R645-301-710 thru R645-301-720 and R645-301-750 64
R645-301-731.800 WATER RIGHTS AND REPLACEMENT 64
R645-301-732 SEDIMENT CONTROL MEASURES 65
R645-301-732.200 SEDIMENTATION PONDS 65
R645-301-733-733.240 IMPOUNDMENTS 65
R645-301-734 DISCHARGE STRUCTURES 66
R645-301-735 DISPOSAL OF EXCESS SPOIL 66
R645-301-736 COAL MINE WASTE 66
R645-301-737 NONCOAL MINE WASTE 66
R645-301-738 TEMPORARY CASING AND SEALING OF WELLS 66
R645-301-740 DESIGN CRITERIA AND PLANS 66
R645-301-741 GENERAL REQUIREMENTS 66
R645-301-742.200 SILTATION STRUCTURES 67
R645-301-742.220 SEDIMENTATION POND 67

R645-301-742.230 OTHER TREATMENT FACILITIES 68
R645-301-742.240 EXEMPTIONS 68
R645-301-742.300 DIVERSIONS 69
R645-301-742.300.310-314 GENERAL REQUIREMENTS 69
R645-301-742.320 DIVERSION OF PERENNIAL AND INTERMITTENT STREAMS 70
R645-301-742.330 DIVERSION OF MISCELLANEOUS FLOWS 71
R645-301-742.400 ROAD DRAINAGE 72
R645-301-743 IMPOUNDMENTS 72
R645-301-744 DISCHARGE STRUCTURES 73
R645-301-745 DISPOSAL OF EXCESS SPOIL 73
R645-301-746 COAL MINE WASTE 73
R645-301-747 DISPOSAL OF NONCOAL MINE WASTE 73
R645-301-750 PERFORMANCE STANDARDS 74
R645-301-760-765 RECLAMATION 75

~~LIST OF MAPS~~

~~HM-9 North Rilda Area~~
~~Geologic and Hydrologic Data~~

~~HM-10 Deer Creek Mine~~
~~Right Fork of Rilda Canyon~~
~~Profiles and Geologic Cross Sections~~

LIST OF APPENDICES

Appendix A **Response of Springs to Longwall Coal Mining at the Deer Creek and Cottonwood Mines, Wasatch Plateau, UT**
Appendix B **Drainage and Sediment Control Plan**

R645-301-710 INTRODUCTION

This application provides a detailed description of the hydrology, including groundwater and surface water quality and quantity, of the land within the permit and surrounding area (refer to Introduction: Figure 1, 2, and 3 of this Volume~~Figure R645-301-700a~~).

Since 1989 detailed data on the hydrology of the land within the permit and surrounding area have been collected, compiled and analyzed by PacifiCorp and several governmental agencies. Information collected by PacifiCorp is the result of exploratory drilling, field investigations, geologic mapping, aerial photography, spring surveys, groundwater tests, monitoring of numerous wells and stream stations, climatological monitoring, and investigations by independent consultants. The data collection program is part of a complete Hydrologic Monitoring Program which has been approved by the State of Utah, Division of Oil, Gas and Mining (DOGM) and the Office of Surface Mining (OSM). All data collected have been and will continue to be submitted to OSM, DOGM, United States Forest Service (USFS), and the Bureau of Land Management (BLM) each year in the annual Hydrologic Monitoring reports.

PacifiCorp has a policy of close cooperation with many agencies and has invited, encouraged, and permitted numerous agencies to conduct investigations and experiments within and adjacent to the permit area. The resulting information produced by these investigations is quite extensive and has been utilized throughout this application.

R645-301-711 GENERAL REQUIREMENTS

711.100	Existing hydrologic resources as given under R645-301-720
711.200	Proposed operations and potential impacts to the hydrologic balance as given under R645-301-730
711.300	The methods and calculations utilized to achieve compliance with hydrologic design criteria and plans given under R645-301-740
711.400	Applicable hydrologic performance standards as given under R645-301-750
711.500	Reclamation activities as given under R645-301-750

R645-301-712 CERTIFICATION

All cross sections, maps, and plans required by R645-301-722 as appropriate and R645-301-731.700 will be prepared and certified according to R645-301-512.

R645-301-713 INSPECTION

~~No impoundments are planned for the North Rilda Area.~~ Impoundments associated with the current Deer Creek Mine facilities including the North Rilda Canyon Portal Facilities will be inspected as described under R645-301-514.300.

R645-301-720 ENVIRONMENTAL DESCRIPTION

R645-301-721 GENERAL REQUIREMENTS

The existing pre-mining hydrologic resource of the East Mountain property is subdivided into the following sections:

A. EXISTING GROUNDWATER RESOURCES
   1. Regional and Permit Area Groundwater Hydrology
   2. Regional and Permit Area Geology
   3. Regional and Permit Area Groundwater Characteristics
   4. Springs and Seeps
   5. Groundwater Quality
   6. Mine Dewatering
   7. Groundwater Rights and Users
   8. North Emery Water Users Association (NEWUA)
      Rilda Canyon Springs

B. EXISTING SURFACE RESOURCES
   1. Regional and Permit Area Surface Water Hydrology
   2. Surface Water Quality
   3. Soil Loss and Sediment Yield

A. EXISTING GROUNDWATER RESOURCES

1. REGIONAL AND PERMIT AREA GROUNDWATER HYDROLOGY

The characteristics and usefulness of a groundwater resource are dependent upon the geology of the water-bearing strata and on the geology and hydrology of the recharge area. Groundwater movement and storage characteristics are dependent on the characteristics of the substratum. To facilitate an understanding of groundwater of the East Mountain property including the North Rilda Area, a discussion of pertinent regional geologic features is presented below.

2. REGIONAL AND PERMIT AREA GEOLOGY

The East Mountain property is located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs dropping steeply to the valley below. Relief of up to 2,500 feet is measured from the Castle Valley lowland to the plateau above. The following discussion summarizes the structural geology and stratigraphy of the region and the permit areas located within the East Mountain property.

Strata in the East Mountain permit area are gently down-folded in the area of the Straight Canyon Syncline which is present in the central portion of the East Mountain (see Volume 8 - Geologic Section of the Deer Creek MRP). The bearing of the Straight Canyon Syncline is approximately N30^{o}E and the structure plunges to the southwest. Dips in the syncline range from two to six degrees with the north limb dipping the steepest.

In the area south of the Straight Canyon Syncline the coal seam dips gently in a northwest direction toward the syncline; however, to the northwest of the Straight Canyon Syncline both the Hiawatha and Blind Canyon seams dip in a southeast direction at three to five degrees.

The strata within the property have been offset by a series of north-south trending normal fault zones. Generally, the faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in both the Deer Creek and Cottonwood/Wilberg mines.

The Pleasant Valley Fault consists of two parallel faults about 150 feet apart. The faults' total displacement (where it was intersected in the Deer Creek Mine) to the north is 150 feet with its down thrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine near the south end of the property.

Another north-south trending fault, the Deer Creek Fault, is present to the east of the Pleasant Valley Fault. It limits the eastward development of the Wilberg/Cottonwood and Deer Creek mines. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being down thrown.

A northeast-southwest trending fault system, the Roans Canyon Graben, is present along the axis of the Straight Canyon Syncline. The system contains up to six normal faults having displacements ranging from a few feet to over 150 feet. Coal deposits present to the north of the fault have been accessed through rock tunnels driven from the 3rd North section of the Deer Creek Mine.

The rock formations exposed in the East Mountain area range from Upper Cretaceous to Tertiary in age (see Volume 8 - Geologic Section of the Deer Creek MRP). The formations, in ascending order, are the Masuk Shale member of the Mancos Shale, Star Point Sandstone, Blackhawk, Castlegate Sandstone, Upper Price River, North Horn, and Flagstaff Limestone. The coal deposits are restricted to the lower portion of the Blackhawk Formation.

The Masuk Shale is the upper member of the Mancos Shale and consists of light to medium gray marine mudstones. Usually this formation weathers readily, forming slopes which are often covered by debris. It is generally devoid of water.

Overlying and intertonguing with the Masuk Shale is the Star Point Sandstone. In the East Mountain area the Star Point Sandstone consists of three or more massive cliff-forming sandstones totaling about 400 feet in thickness. Generally, the sandstones are fine to medium-grained and moderately well-sorted. The upper contact of the Star Point Sandstone is usually quite abrupt and readily identifiable on the outcrop. Even though the Star Point Sandstone formation exists throughout the entire East Mountain property, the low permeability and lack of recharge, i.e., very little outcrop exposure and limited vertical groundwater migration caused by the mudstone layers of the North Horn and Blackhawk formations, limit its usefulness as a water producing aquifer. Locally, the Star Point Sandstone exhibits aquifer characteristics. These are isolated occurrences where regional faults have created secondary permeability and have been intersected by major canyons with perennial streams. An example is Little Bear spring located in Huntington Canyon.

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones, and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation. Many of the tabular sandstone channels form local perched water tables. The total thickness of the Blackhawk Formation in the East Mountain area is about 750 feet.

The Castlegate Sandstone, the lower member of the Price River Formation, generally caps the escarpment which surrounds the eastern limit of the property. The Castlegate Sandstone consists of about 250 feet of coarse-grained, light gray, fluvial sandstones; pebble conglomerates; and subordinate zones of mudstones.

The Upper Price River Formation, which overlies the Castlegate Sandstone member, is about 350 feet thick and forms slopes which extend upward from the Castlegate escarpment. Although some mudstones are present, fine-grained, poorly sorted sandstones dominate the Upper Price River Formation.

The North Horn Formation is the youngest formation exposed in the North Rilda Area and is about 200 to 250 feet thick. Mudstones dominate the rock types present and are generally gray to light brown in color. Localized, lenticular sandstone channels are present throughout the formation. The sandstone beds are more common near the upper and lower contacts of the formation.

The Flagstaff Limestone Formation overlies the North Horn Formation and consists of white to light gray lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains, forming a cap on the highest plateaus to the west and south of the North Rilda Area.

3. REGIONAL AND PERMIT AREA GROUNDWATER CHARACTERISTICS

Waters entering the groundwater system are mostly from snow melt. The amount of water which enters the groundwater system is highly variable from one site to another. The low surface relief on the top of East Mountain to the south of the North Rilda Area encourages the infiltration of melting snow. Conversely, in the North Rilda Area where steep slopes are common, infiltration is limited. All of the geologic formations which are exposed in the area have relatively low permeability which further reduces the amount of water entering the groundwater system. Probably less than five percent of the annual precipitation recharges the groundwater supply (Price and Arnow, 1974; U. S. Geological Survey, 1979).

Geology controls the movement of groundwater. Because of the low permeability of the consolidated sedimentary rocks in the East Mountain area, groundwater movement is primarily "through fractures, through openings between beds, and, in the case of the Flagstaff Limestone, through solution openings" (Danielson et al., 1981, p. 25).

The majority of the groundwater which infiltrates the Flagstaff Limestone flows down vertical fractures which intersect sandstone channel systems in the North Horn Formation. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the upper Price River Formation and Castlegate Sandstones; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. Due to the topographic configuration of the North Rilda Area, recharge is limited and only two springs and two seeps were located during spring and seep surveys.

Data have been collected from numerous coal exploration drill holes, from within the mine workings, from surface drainages, and from the springs in the area. The data have identified two separate isolated aquifer systems on the East Mountain property; the first is localized perched water zones in the North Horn Formation, and the second is a combination of localized perched water tables in the Blackhawk Formation and the Star Point Sandstone which exhibits some limited potential as a regional aquifer. Stratigraphy is the main controlling factor restricting groundwater movement and development of

regional and perched aquifer systems within the East Mountain property. A complete description of the various formations and how they influence the groundwater systems is located in Volume 9 - Hydrologic Section: *Regional Groundwater Characteristics*. A secondary factor controlling existance and movement of groundwater in North Rilda Area is topographic configuation(incised canyons) of the area. To document the geologic and hydrologic characteristics of the North Rilda Area, a total of twenty three surface exploration holes have been completed, including a series of holes in the Right Fork of Rilda Canyon in the area of the proposed mainline development crossing of the Right Fork. Due to the limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Star Point Sandstone Formation around the entire North Rilda Ridge, the Star Point appears to be unsaturated within the North Rilda Area. The following table documents the holes completed, total depth, amount of non-sandstone lithology directly below the Hiawatha seam, amount of Star Point Sandstone penetrated and the hydrologic data.

NORTH RILDA SURFACE EXPLORATION DATA

Drill Hole #	Total Depth (feet)	Total Depth (below base of Hiawatha Seam) (feet)	Non-Sandstone Lithology Below Hiawatha Seam (feet)	Star Point Sandstone Penetrated (feet)	Hydrologic Data
EM-47	300	114.9	4.9	119.8	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-48	1860	160.0		160	No Measureable Quantities
EM-49	1680	102.4		102.4	No Measureable Quantities
EM-50	1680	81.6	6.6	88.2	No Measureable Quantities
EM-51	1660	83.4	1.4	84.8	No Measureable Quantities
EM-52	1560	68.1	2.1	70.2	No Measureable Quantities
EM-53	716	7.7		7.7	Dry
EM-55	1680	63.9	2.9	66.8	No Measureable Quantities
EM-56C	422	29.9	26.4	29.9	Est. @ 15 GPM from the Colluvial/Alluvial deposits
EM-105	1620	84.9	0.9	85.8	No Measureable Quantities
EM-107	767	8.5		8.5	Dry
EM-153	796	12.1	1.0	13.1	Dry
EM-154	795	15.6	1.1	16.7	Dry
EM-155	716	14.5		14.5	Dry
EM-156	755	13.1		13.1	Dry
EM-157	436	17.0	4.6	21.6	Dry
EM-158	226	13.8	9.2	23.0	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-159	227				Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-160	257	5.7	1.1	4.6	Est. @ 5 GPM from the Colluvial/Alluvial deposits
EM-161	287	6.4		6.4	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-162	307	7.6	0.6	7.0	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-163	327	9.6	3.4	6.2	Est. @ 2 GPM from the Colluvial/Alluvial deposits
EM-164	366	17.1	1.2	15.9	Est. @ 2 GPM from the Colluvial/Alluvial deposits

Structural Hydrologic Features

Structural features, such as the Roans Canyon Fault Graben, the Straight Canyon Syncline, and the Deer Creek Fault, had a influence on the hydrologic regime south of the North Rilda Area within the East Mountain permit area (detailed in Volume 9 - Hydrologic Section). Geology of the North Rilda Area is less complex than that of the central portion of the East Mountain property (see Volume 8 - Geology Section). A fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 map HM-9). The Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area permit extension in the Beaver Creek No. 4 Mine and consisted of series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system. PacifiCorp has conducted extensive exploration programs to delineate the Mill Fork Graben including a series of close spaced drill holes in the Right Fork of Rilda Canyon. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon (refer to Volume 9 map HM-9). If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control groundwater if present.

Alluvial Aquifers

Utah regulations require that the presence of alluvial valley floors in or adjacent to the mine project area be identified. The regulations define an alluvial valley floor as "unconsolidated stream-laid deposits holding streams with water availability sufficient for sub-irrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits formed by unconcentrated runoff or slope wash together with talus, or other mass-movement accumulations, and wind blown deposits". The drainage systems of the North Rilda Areas are examples of colluvial deposits, consisting of alluvium in part and containing angular rock fragments, talus, cliff debris, and material from avalanches. Even though these deposits are defined as colluvial/alluvial, mining below the stream segments in the North

Rilda Area will be restricted to first mining only (refer to Volume 9 maps HM-9, HM-10, and Engineering Section, R645-301-500, of this document for mine plan layouts and subsidence impacts). Alluvial deposits in and adjacent to the North Rilda permit area have been mapped and reported in Doelling's "Wasatch Plateau Coal Fields" (1972). The report indicated that alluvia in the area are found solely along Huntington Creek below the Rilda Canyon confluence in the Huntington drainage system. A complete description of the alluvial aquifers is outlined in Volume 9 - Hydrologic Section.

4. SPRINGS AND SEEPS

The 1979 water reconnaissance program of East Mountain Springs was initiated with an aerial survey of East Mountain properties via helicopter. During the survey, the locations of 102 possible springs were plotted on aerial photographs. Subsequent field work confirmed the locations of forty-eight (48) springs producing measurable amounts of water. The remaining sightings proved to be minor seeps, dry or runoff from other springs. Between 1979, the time PacifiCorp began monitoring springs on East Mountain, and 1991, additional field reconnaissance projects increased the number of springs from less than fifty (50) to nearly eighty (80). Each spring site on East Mountain has been studied to determine the geologic circumstances that cause the springs to occur. The mode of occurrence for each spring has been tabulated on the "Springs Geologic Conditions Inventory" sheets located in the annual Hydrologic Monitoring reports (refer to Volume 9 - Hydrologic Support Information). The springs on East Mountain originate in several different ways (see Volume 9 - Hydrologic Section or Annual Hydrologic Monitoring Reports); however, many springs share the same mode of occurrence and, in some cases, are related.

The most frequent occurrences of springs are those located about 150 to 350 feet below the top of the North Horn Formation (see Volume 9 - Hydrologic Section: Figure HF-6). The drill hole data show a predominance of fluvial siltstone and sandstone at that stratigraphic interval. These sedimentary rocks represent many isolated fluvial systems which are water-bearing. The springs are formed where the fluvial channels intersect the land surface. Because the fluvial channels within this zone are generally not interconnected, the springs are not interrelated but share the same mode of occurrence.

Numerous springs located in the lower portion of the North Horn Formation occur when water flowing through fluvial sandstones, which are underlain by a thin zone of impervious mudstone at the base of the North Horn Formation, intersect the land surface. The surface drill hole data indicate that impervious mudstone units occur at the upper and lower portion of the North Horn Formation. Even though these individual mudstone layers are discontinuous, the occurrence of this type of strata exists throughout the East Mountain Property. As part of Volume 9 - Hydrologic Support Information, logs of representative holes from the East Mountain exploration programs are included to document the occurrence of this type of strata (additional drill hole data are located at PacifiCorp's Salt Lake or

Huntington offices). The springs related to this mode of occurrence are not generally interrelated because they are fed by waters flowing through isolated fluvial channel sandstones and siltstones.

Several springs are located along the Roans Canyon Fault Graben. Generally, the springs are located within the North Horn Formation along the fault zone. Few springs are located in the area below the base of the North Horn Formation below where the impervious mudstone is located, supporting the fact that water percolating down a fracture or fault is stopped from further downward travel when it reaches the impervious clay zone which forms a seal along the fracture. Many of the largest springs on East Mountain are located along this fault system. Because the fault system is located along the trough of the Straight Canyon Syncline, water from both the north and the south flows toward the fault where it is allowed to migrate to the land surface. The springs located along this fault zone are generally interrelated.

A few springs are located within both the Flagstaff and Price River formations; however, their occurrence is insignificant in comparison to springs located in the North Horn Formation.

Generally springs with discharges exceeding 50 gpm are associated with faulting where permeability has been increased by fracturing. The discharge of the springs varies directly with the amount of precipitation and also varies seasonally. Discharge is greatest during the snow melt period, normally from late April through the month of June. Following periods of groundwater recharge the discharge recedes fairly rapidly at first, then gradually, indicating a double porosity effect. At the end of the water year the remaining discharge is only twenty to thirty percent (20-30%) of the peak discharge. Annual variations and historical comparisons are depicted in the annual Hydrologic Monitoring reports. During reconnaissance surveys of the North Rilda Area, only two springs were located within the permit extension area, spring 80-50 in Section 29 and the Rilda Canyon Springs located in Section 28. In addition to the springs, two minor seeps were located within the permit extension area, one along the trace of the Mill Fork Canyon fault, and the second seep is located at the formational contact between the Blackhawk/Star Point Sandstone (refer to Volume 9 - Hydrologic Section).

5. GROUNDWATER QUALITY

Groundwater chemical quality is very good in strata above the Mancos Shale. The USGS reports a range in dissolved solids from 50 to 750 mg/l for samples from 140 springs in the region issuing from the Star Point Sandstone and overlying formations (Danielson et al., 1981). Danielson et al. (1981) identified the regional trends of decreasing water quality from north to south and west to east across the Wasatch Plateau. Waters percolating through the underlying Mancos Shale quickly deteriorate, with total dissolved solids concentrations frequently exceeding 3000 mg/l.

Additional studies by PacifiCorp have confirmed the primary findings of the USGS concerning regional trends in quality. Originally, decreasing quality from north to south was believed to depict the groundwater flow direction, and the quality decreased as a function of the time it traveled through the strata. The time travel component is probably an important factor. In 1985 a surface exploration program identified the existence of an area of residual heat from an ancient burn on the outcrop throughout the southern portion of East Mountain. The high temperature was also explored within the mine and a portion of reserves were lost because of the situation. It is now theorized that the high temperature water dissolved the mineral constituents of the formations, thereby altering the water chemistry. The quality also decreases vertically because of the influence of marine sediments along with the trend of decreasing quality from north to south.

An examination of Figure HF-7 (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP) indicates that a relationship exists between elevation and the total dissolved solids concentration of the springs and the surface streams. A distinct relationship exists with respect to surface and water emanating from the springs. The data indicate that concentrations of dissolved materials increase with diminishing elevation for both surface streams and springs. The change in quality is a function of the differences in the chemical character of geologic formations which outcrop at different elevations (see Table HT-2 for East Mountain springs water quality, refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP).

To more closely identify springs which are related, water samples are analyzed to determine the percentage of cations and anions in solution. These percentages have been graphically represented as cation-anion diagrams in the annual Hydrologic Monitoring reports. The purpose of the diagrams is to identify groups of related springs by water chemistry. The diagrams clearly show the similarity of water quality of springs originating in the same geologic formation. To better visualize this concept, the cation-anion diagrams are presented by the geologic formation in which they originate. A general pattern for the Flagstaff Limestone and Price River formations can be recognized for each year in which the cation/anions were analyzed. A consistent pattern for the North Horn Formation is less obvious due to the complex geology of the formation itself. One aspect the cation-anion diagrams demonstrate is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist.

PacifiCorp began in-mine water quality monitoring in 1977. With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP, Maps HM-2 and HM-3). As with the springs, quality varies from individual sites, but quality from the individual sites remains constant versus time (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP Figure HF-8). The overall quality collected from each mine is shown in (refer to Volume 9 - Hydrologic Section of the Deer Creek Mine MRP Table HT-3).

The predominant dissolved chemical constituents of the groundwater from both surface springs and samples collected in the mine are calcium, bicarbonate, magnesium, and sulfate. Concentrations of magnesium are normally about one-half the concentration of calcium. Sulfate concentrations are typically higher in water from springs issuing from the Starpoint-Blackhawk aquifer zone or confined aquifers intersected by mine workings. As mentioned early, water quality degrades from the north to the south and also vertically.

6. MINE DEWATERING

Water encountered within the Deer Creek mine has generally been confined to the perched aquifer systems and fractures and faults associated with the Blackhawk Formation. Water enters the mines through various avenues including roof drippers from overlying fluvial sandstone channels, bolt holes, tension cracks in the overlying strata, longwall caved areas, and where fractures or faults have been intersected by the mine workings. The lower Blackhawk/Star Point Sandstone Formation appears to be unsaturated within the North Rilda Area. This is due to the limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Blackhawk and Star Point Sandstone formations around the entire North Rilda Ridge. Based on extensive surface exploration data, (refer to REGIONAL AND PERMIT AREA GROUNDWATER CHARACTERISTICS), intercepted groundwater in the North Rilda ridge will be limited primarily to perched aquifers in the lower Blackhawk Formation. Mountain Coal's No. 4 Mine located to the north of the North Rilda Area with a similar topograhic location intercepted only minor quanities of groundwater and discharge from the mine was not required. Excess water intercepted in the mine will be pumped to storage areas or discharged from the mine under approved UPDES permits (refer to Volume 9 - Hydrologic Section: Appendix B for UPDES permit information). A complete description of the quality and quantity is reported in the Annual Hydrologic Monitoring reports and also in the PHC (Section 728).

7. GROUNDWATER RIGHTS AND USERS

Nine springs have been developed in Huntington Canyon to provide for domestic, industrial, and commercial water needs. Currently, Huntington City utilizes two springs in Huntington Canyon, Big Bear Canyon Springs and Little Bear Canyon Springs. The North Emery Water Users Association (NEWUA) also utilizes springs in Huntington Canyon to provide for domestic and industrial water needs in areas outside of Huntington City. Along with springs in Huntington Canyon, NEWUA is currently utilizing water from three springs in Rilda Canyon (refer to map HM-1, HM-5 and HM-8 Volume 9 - Hydrologic Section of the Deer Creek MRP).

8. NORTH EMERY WATER USERS ASSOCIATION (NEWUA)

Of concern to PacifiCorp-Fuel Resources is the proximity of proposed mining activities in Rilda Canyon to the Rilda Canyon Springs which currently serve as a culinary water source to the North Emery Water Users Association (NEWUA) serving some 410 connections. Due to the importance of these springs, a separate discussion is provided herein describing the nature of NEWUA's Rilda Canyon Springs and the sources of the waters issuing from them. The structural geologic setting is described, followed by an analysis of spring flow quality and quantity.

Although no significant north-south trending faults are known to exist in the area of the Rilda Canyon springs, other physical features in the area indicate that the major springs issuing from the Star Point Sandstone in the Huntington Canyon, and Little Bear Canyon are fault or fracture related (refer to Map HM-6 [Volume 9 - Hydrologic Section of the Deer Creek MRP] for spring locations). A noteworthy feature related to the occurrence of the principal Starpoint springs is the location of each spring with regard to a known fault or the location with regard to the linear orientation of significant north-south trending side drainage channels. As illustrated on Map HM-6, Little Bear Spring is directly in line with the western edge of the graben identified in Beaver Creek Coal Company's No. 4 Mine. The Rilda Canyon Springs lie directly in line with a north-south trending side canyon to the south as well as one to the north. From examination of topographic features of the area under a stereoscope, it appears that the linear relationship of side drainage channels (or lineament) can be traced through Mill Fork Canyon to the north, intersecting the northeast-southwest trending graben (encountered by Beaver Creek Coal) near the northern ridge of Mill Fork Canyon. Two separate geophysical techniques were employed in Rilda Canyon to assist interpreting the occurrence and movement of groundwater. First, Very Low Frequency Electromagnetic Analysis (VLFEM) and second, resistivity and induced polarization were utilized to verify the existence of fracture zones in line with the lineament traced from Rilda into Mill Fork Canyon.

The VLFEM study consisted of two transects in an east-west direction across the Rilda Canyon Spring area, one along the road that bypasses the springs to the north and one along the road bypassing the springs to the south. Data from the east-west transect are shown on Figure HF-9B (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). In both transects, a significant subsurface anomalous condition was encountered in the vicinity of the springs and directly in line with the north and south canyons. In addition to the east-west transect, three north-south transects were conducted in order to delineate possible fracture zones parallel to the stream. Data from the north-south transect are illustrated in figures HF-9D through 9E (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) and locations of the transect are shown on Figure HF-9F (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Analysis of the north-south transect shows an anomalous area, which might indicate the existence of a fault or fracture in the westernmost transect as shown on Figure HF-9C (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). This anomalous area was also

evident on the resistivity-IP survey which will be discussed below. The two transects which were conducted lower in the canyon do not show strong evidence of any anomalous areas [see figures HF-9D and 9E (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP)].

VLFEM surveys conducted in Rilda Canyon were performed by Hansen Allen & Luce (HA&L) of Salt Lake City, Utah. Survey procedures utilized by HA&L consisted of selecting a transmitter station which provides a field approximately parallel to the traverse direction, i.e., approximately perpendicular to the expected strike of a conductor. VLFEM transmitter stations are located at several points around the globe. They broadcast at frequencies close to 20,000 Hz, which is low compared to the normal broadcast band. Data were collected utilizing a hand held instrument manufactured by Corne Geophysical Limited on fifty-foot intervals along the transect with two readings collected at each location: 1) field strength, and 2) dip angle (in degrees from a horizontal plane). It should be stressed that data collected during VLFEM surveys are very sensitive to sharp changes in topography and natural and manmade metallic material such as fences, pipelines, etc. In Rilda Canyon very little manmade materials exist except for wire fence which surrounds the NEWUA spring collection area shown on Figure HF-9B (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Pipelines used to collect and transport the spring water in Rilda Canyon are constructed of PVC and are considered to have little or no adverse impact on the data that was collected. It should also be stressed that the VLFEM data should only be considered one facet of the hydrologic investigation conducted in Rilda Canyon and not the sole source of hydrologic interpretation.

PacifiCorp contracted Geowestern to conduct a resistivity and induced polarization (I.P.) Survey in Rilda and Mill Fork canyons in the summers of 1989 and 1992 (refer to Volume 9 - Hydrologic Support Information). The intent of the survey was to identify fractures in the strata and the depth of alluvium in Rilda Canyon by contrasting areas of Resistivity and I.P. response. As with the VLFEM data, resistivity-I.P. assisted in the hydrologic interpretation and was utilized to plan the location and depth of wells constructed for hydrologic drawdown conducted in November 1990.

Resistivity-I.P. surveys have been utilized for many years to map out subsurface occurrences of groundwater or mineralization. Because groundwater within the Wasatch Plateau tends to be concentrated along fractures, Resistivity-I.P. surveys can effectively identify fractures, faults included. Where strata are present at depths having highly contrasting resistivity or I.P. response, displacement along a fault can be detected by the offset of the depth to the contrasting beds. Where faults are present within a survey area but the strata is fairly uniform in resistivity and I.P. response, no displacement will be recognized in the data collected but the fault plane itself will most likely be easily detected. The latter scenario is normally the case within the permit area; therefore, the surveys will identify water-filled fractures and faults but will not always differentiate between the two. Most of the anomalies identified will be fractures, and differentiating between faults and fractures requires additional geologic data provided by field mapping or published data.

The resistivity-I.P. survey was conducted on nine separate lines, eight in Rilda Canyon and one in Mill Fork Canyon (see Map HM-7 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). Three of the lines (longitudinal) were along roads in the canyon bottoms in both Rilda and Mill Fork canyons. Six lines were transverse, across Rilda Canyon, and were designed to identify the depth of alluvial fill in the canyon bottom.

The resistivity survey used the pole-dipole configuration with station intervals of fifty (50) feet on longitudinal lines and twenty (20) feet on transverse lines. Resistivity and I.P. values were measured at separate intervals of 100, 200, 300, and 400 feet on each of the longitudinal lines and 20, 40, 60, and 80 feet on the transverse lines. These separations in data collection allowed the recovery of data that revealed conditions up to 400 feet in depth on both the longitudinal and transverse lines. The I.P. survey used the time-domain method and reflects areas where the ground has a greater electrical capacitance, a condition normally caused by disseminated sulfides which, on our property, would most likely be minor amounts of pyrite along fractures.

Rapid changes in the resistivity or I.P. response of the surveys are almost always associated with fractures in a geologic setting and can follow a distinct trend at depth which allows the determination of the angle of dip of the fracture. The Resistivity-I.P. Survey identified several anomalies indicating fractures and/or faults. The fractures which cause the anomalies dip steeply in a westerly direction or are vertical. The degree of dip associated with each fracture is shown on Map HM-7 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). Each of the anomalous areas representing fractures was examined in the field and on aerial photographs to determine the significance of the anomalies. The geophysical data was then compared with geologic data collected in the field and from publicly available reports, making it possible to locate a fault graben (Mill Canyon Graben) system trending in a northeast direction which cuts across the western portion of our northern reserves (see Map HM-7 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). The southernmost fault of the graben was intersected in Beaver Creek Coal Company's #4 Mine in Mill Fork Canyon and has a displacement of about twenty (20) feet down on the northwest side. Where it crosses the northern end of East Mountain, the fault has been mapped to have a displacement of thirty (30) feet down on the northwest side. All other faults in the graben system have a relative displacement which is up on the northwest side.

Several anomalies to the southeast of the Mill Fork Canyon Graben were identified by the Resistivity-I.P. Survey. No displacement is identified on any of them. The anomalies are on the same geologic trend as areas mined in the Beaver Creek Coal Company #4 Mine where no faults exist; therefore, in all probability they are water saturated fractures having no vertical displacement.

The transverse lines (R-3 through R-5, and R-7 through R-9) were designed to provide data regarding the depth of the alluvium in the canyon bottom. The alluvial/bedrock contact is identifiable on the

profiles and provides important information on the hydrology of the springs located in the canyon. The alluvial floor is up to seventy (70) feet thick as indicated by resistivity profiles R-3 through R-5 and drill hole information obtained from P-6 and P-7 (see Figure HF-10 [refer to Volume 9 - Hydrologic Section of the Deer Creek MRP]). Again, it should be stressed that the resistivity data should only be considered one facet of the hydrologic investigation conducted in Rilda Canyon and not the sole source of hydrologic interpretation.

Description of NEWUA Spring Collection System

The NEWUA spring system consists of a series of collection lines extending westward up Rilda Canyon and southward up a small side drainage as shown on Map HM-8 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). The NEWUA spring system is metered at four locations. Meter 1 (Side Canyon Spring) is located at the downstream end of a collection line which enters Rilda Canyon from the South. Meter 2 (Side Canyon Spring plus South Spring) is located near the bottom of the main east-west trending collection line which lies to the south of Rilda Canyon Creek at a point just upstream (west) of the main spring collection box. Meter 2 records combined flows from both the Side Canyon (Meter 1) as well as additional inflows which enter the system below Meter 1 known as South Spring. Meter 3 (North Spring) records flows for the east-west central collection line which was constructed through the central portions of the valley near Rilda Canyon Creek. Meter 4 (North Spring) collects data from the north collection line located on the north side of Rilda Canyon Creek. Meter 3 and Meter 4 were combined in 1995 during the Rilda Canyon road improvement project.

In addition to the main spring collection lines, there are two flumes in the vicinity which monitor flow rates within Rilda Canyon Creek. The upper flume, RCF-2, is located adjacent to the extreme west end of the spring collection system monitored by Meter 4. Flume RCF-3 is located in Rilda Canyon Creek adjacent to spring collection Meter 2.

Initially five shallow wells were located in the area surrounding the spring collection system to monitor groundwater level fluctuations through time. The locations of the wells are shown on Volume 9 Map HM-9 ~~(included with this submittal)~~. Wells 1 through 5 are relatively shallow wells which were constructed prior to 1989. In 1990 two additional large diameter wells were developed, (Wells 6 and 7) adjacent to wells P-2 and P-3, respectively, in order to obtain more complete groundwater data through aquifer testing. Wells P-2 and P-3 were abandoned and sealed in 1995.

Quantity

Through the cooperative efforts of PacifiCorp and NEWUA, flow meters were installed in September 1990 to isolate individual spring areas for quantity and quality [refer to Map HM-8 (Volume 9 - Hydrologic Section of the Deer Creek MRP)]. Flow from Rilda Canyon Springs is directly related

to the spring runoff (i.e. precipitation received from the previous winter). Spring output ranges from approximately 300 GPM during high runoff to approximately 75 GPM during the winter months. Based on measurements collected prior to the time when Meters 3 and Meter 4 were combined, the majority of the flow was from Meters 3 and 4, approximately 46% and 49%, respectively (refer to Annual Hydrologic Reports for detailed flow information). The seasonal variation of the monthly average flow from all NEWUA's Rilda Canyon Springs is shown in the Annual Hydrologic Monitoring Reports. With the installation of the flow meters, individual spring contribution to the total flow can be plotted over time.

PacifiCorp contracted Hansen, Allen & Luce (HA&L) in 1990 to conduct a hydrologic test in Rilda Canyon. The overall purpose of the hydrologic testing was to determine to the degree possible: 1) general hydrologic conditions associated with the NEWUA springs, including the general direction of groundwater movement; 2) the potential origin of waters feeding the NEWUA springs; and 3) a determination of general aquifer characteristics, including transmissivity. Earlier reports (April 1983 and March 1984) prepared by Vaughn Hansen Associates identified the source of water from the North Spring to originate from two general sources. The earlier report concluded that the source of water originated from a north-south trending subsurface anomaly which may be a strike slip fault located immediately downstream of the main North Spring area. The latter, using additional data collected, concluded that there also appears to be an east-west trending anomaly which intersects the north-south anomaly just north of the North Spring. Water collected in the east-west anomaly from surface and/or fault sources located higher in the canyon may issue forth at the North Spring as the water comes in contact with the north-south trending anomaly. It was believed at the onset of the project that the source of water (whether from the north-south trending anomaly or from sources farther up the canyon) could be determined by pumping strategically placed wells near the sources of water.

Upon initiation of the project PacifiCorp and HA&L met to determine the most efficient method of proceeding with the proposed pumping tests. It was mentioned that because of the proximity of Well P-6 to the main spring collection area, pumping Well P-7 might produce clearer test results. Pumping P-6 would have an impact upon the main spring collection system; however, any attempts to determine the source of spring water could be masked by the influence of the drawdown cone. That is, by pumping P-6 both sources of recharge to the North Spring would be drawn upon, thereby making the attempt at isolation more difficult.

Soon after initiation of the project it was decided that the most complete data could be obtained by pump testing P-7 because of its location upgradient of the main spring collection area. If P-7 could be pumped sufficiently, the potential source of recharge water feeding the North Spring from the alluvial canyon fill west of the spring could be reduced without affecting water recharging the springs from the north-south trending anomaly or fault system. The level of impact due to pumping P-7 would then be an indicator of the general source of water issuing from the NEWUA springs.

The purpose of the pump test performed on P-7 was to pump the well to its maximum potential for a period of time sufficient to note and record impacts upon the NEWUA springs or other wells located in the vicinity. The amount of pumping and the level of impact on the local systems was used subsequent to the test to help document the source of water discharging into the NEWUA spring collection system. A pump test was run on P-7 continuously from 4:00 p.m. on November 13 through 12:30 p.m. on November 20, 1990. Throughout this period records were kept related to pumping conditions and flow rate discharging P-7, water levels in wells P-1 through P-7, and spring flows recorded at NEWUA spring collection meters 1 through 4. Well P-3 was dry throughout the test.

Aquifer Characteristics

The local groundwater system in the vicinity of the NEWUA springs consists of an unconfined alluvial valley fill aquifer as well as bedrock and fracture systems. Resistivity data provided by PacifiCorp indicate that the total maximum depth of alluvium ranges from 50 to 73 feet at the three locations where cross sections were taken. The locations of the resistivity cross sections within Rilda Canyon are shown on Map HM-7 (refer to Volume 9 - Hydrologic Section). The width of the unconfined aquifer varies due to the influence of side drainages which also feed the area.

Water moving throughout Rilda Canyon appears to originate from at least three sources. The first and most obvious source is through the alluvial valley fill, the second is through an east-west trending fracture which is believed to lie to the north of the canyon floor, and the third is potentially through a north-south trending fracture which bisects the canyon just west of the NEWUA spring collection system. Extensive exploration conducted in Rilda and Mill Fork canyons parallel to the trend of the fracture systems outlined in earlier reports have failed to identify structural features which could contribute to the groundwater system. More is mentioned about water quality from these sources later in this document.

Springs within Rilda Canyon are believed to indicate and verify the locations of changes in geologic structure. Examples of local geologic structures and their impact on hydrology have been verified historically through stream and spring flow observations. The canyon drainage west (or above) the interface with the upper contact of the Star Point Sandstone is generally a discharging stream section. When alluvial waters come in contact with the more impermeable members of the upper Star Point Sandstone/Mancos Shale interface, they are often forced to the surface, creating springs. Local NEWUA springs confirm a recharging stream section. When these more impermeable formations are crossed, the stream once more becomes a losing stream until subsurface waters again come in contact with the more impermeable members of the Star Point Sandstone and underlying Mancos Shale formations. Some sections of the stream within Rilda Canyon gain flow, thereby evidencing the locations where subsurface water is forced to the surface by the tighter formations.

Data collected during and following the pump test of P-7 were used to provide estimates of local valley fill aquifer characteristics. For these analyses, data from both pumped Well P-7 and from observation Well P-6 were used during both the drawdown and recovery portions of the test. Well P-6 was used as an observation well over other local wells because 1) it is the closest to the pumped well, 2) it is upgradient from the north-south trending anomaly associated with the spring, 3) it showed the most response to pumping, and 4) the data were more consistent than other data collected.

In order to analyze the data in an acceptable fashion, the data sets were broken into three separate portions. The first data set has been termed the "initial" data set and includes time and drawdown data from P-7 for the beginning period of the test where the flow rate was recorded to be equal to 8.22 gpm. The "intermediate" data set includes data subsequent to that time when the flow rate was increased to an average value over time of 16.4 gpm. The third data set includes data taken during the "recovery" portion of the test after the pump in P-7 was shut off.

Three basic analytical methods--the Cooper-Jacob, Theis, and Neuman methods--were used to estimate aquifer transmissivity for the data contained herein. Each method, along with applicable data, is discussed separately in the following sections.

Cooper-Jacob Drawdown and Recovery Analyses

Drawdown Methods

The Cooper-Jacob straight line method of analysis utilizes a semi-log plot for the display and analysis of the data as shown on Figure HF-12 (refer to Volume 9 - Hydrologic Section). The data shown on the plot entitled "PacifiCorp P-7 Initial Data Q=8.22 gpm" have three general slopes. The first few data points are usually ignored in a pump test because they reflect initial drawdown anomalies generally due to evacuation of the well drill stem or casing. The next set of data, beginning at two minutes and running through 100 minutes, show a good aquifer response and an associated transmissivity of approximately 35,650 gpd/ft. The plot, however, shows that a change in the slope of the data occurred at about 100 minutes. Such a change in grade generally indicates the presence of a boundary condition which, in the case of Rilda Canyon, reflects the bedrock of the canyon walls. Generally under such conditions the slope of the curve after the time in which the boundary was encountered will double (refer to Figure HF-13, Volume 9 - Hydrologic Section). The slope of the straight line for the latter part of the data shows a transmissivity on the order of 21,100 gpd/ft, a forty percent decrease. Based upon this data it is believed that the initial transmissivity of the alluvial valley is on the order of 35,000 gpd/ft for the initial period of pumping, during which time the aquifer is unaffected by distant barriers. After a barrier influences groundwater hydrology, the transmissivity reduces to the estimated 21,100 gpd/ft.

Intermediate data provide similar results. The barrier effects discussed occurred within the first 100 minutes of pumping, before data was collected for this data set; therefore, the majority of the impacts due to the barrier already will have been accounted for although some effects should occur due to an increased pumping rate. With this in mind, the straight line Cooper-Jacob analysis produces a transmissivity of 17,550 gpd/ft, as shown in Figure HF-14 (refer to Volume 9 - Hydrologic Section). Although slightly less, this value is similar in nature and magnitude to that found for the last half of the initial data set.

An analysis of the intermediate data was also made by using data collected from P-6 located approximately 500 feet to the east of P-7. The analysis shown in Figure HM-15 (refer to Volume 9 - Hydrologic Section) indicates that the long-term transmissivity for this data set is in the rage of 23,800 gpd/ft. Again, this is in the general range of estimates already made above.

Recovery Methods

Straight line methods of analysis are also used for well recovery data taken after the pump is shut off. In the case of P-7 the recovery curves are shown as Figures HM-16 and HM-17 (refer to Volume 9 - Hydrologic Section). Immediately after pumping ceases in a well, water levels recover at an abnormally high rate in a similar fashion to what occurred during the first two minutes of the pumping test as shown in Figure HM-12 (refer to Volume 9 - Hydrologic Section). By taking the next set of data, a straight line can be fit to obtain an approximation of long-term transmissivity on the order of 13,700 gpd/ft, as shown in Figure HF-16 (refer to Volume 9 - Hydrologic Section). Although this estimate is a little low compared to the estimate given above, it is of the same order of magnitude.

Short-term transmissivity is checked for the recovery data by fitting a straight line through the low end of the data. The transmissivity under short-term pumping is estimated at 35,900 gpd/ft, which matches very well the 35,650 gpd/ft estimate made by utilizing the Cooper-Jacob straight line drawdown analysis discussed above.

Theis Drawdown Analysis

The Theis method of solution utilizes a log-log plot of drawdown versus time as shown on Figure HM-18 (refer to Volume 9 - Hydrologic Section). The solution is achieved by matching a well function curve to the data as shown. It should be noted that the data utilizing this method of solution does not readily show the boundary condition which was identified by the Cooper-Jacob solution method. There is a slight curvature of the data at about the 100-minute time mark as shown on the plot; however, without other methods it is unlikely that a boundary condition would have been identified for this data set. Since the solution does not identify a boundary condition, the solution

reached is a mix of both short- and long-term transmissivities. An analysis using this approximation method (resulting in an average transmissivity) results in an estimate of 28,450 gpd/ft.

A check of the estimate can be made by averaging transmissivities for both the initial short-term and intermediate long-term data sets obtained using the Cooper-Jacob method. The average of 35,650 and 21,100 gpd/ft is 28,380 gpd/ft, which is within one-half of a percent of the estimate given above using the Theis method.

An analysis of the intermediate data shown on Figure HM-19 (refer to Volume 9 - Hydrologic Section) shows that the estimated long-term transmissivity using the Theis method is on the order of 17,900 gpd/ft, which can be compared to the 17,550 gpd/ft estimate made using the Cooper-Jacob method. The estimates indicated are within two percent of each other, again showing good correlation.

Neuman Drawdown Analysis

The third method of analysis is based upon unconfined aquifer solutions as determined by Neuman. His analysis utilizes two basic curve types. The "Type A" curve is characteristic of that shown on Figures HM-20 and HM-21 (refer to Volume 9 - Hydrologic Section) where the curve is a power curve asymptotic to the horizontal line. "Type B" curves bend in the opposite direction, i.e., they start relatively flat and turn upward as one moves to the right on the plot. Slight trends toward both the "Type A" and "Type B" curves can be seen on Figure HM-20 (refer to Volume 9 - Hydrologic Section). A "Type A" curve could be fit to the data between times 1 and 30, and a "Type B" curve could be fit to the data between times 30 and 1000; however, because
the data is influenced by the presence of a boundary condition (as discussed above) and because the Neuman solution does not identify boundary conditions in its methodology, such an analysis would provide inaccurate results. As a compromise, an average solution is attempted by analyzing the data based upon the complete data set wherein an estimate of 13,150 gpd/ft is obtained. Although lower than some of the earlier estimates made, this estimate again has the same relative order of magnitude.

The intermediate data set was also analyzed using the Neuman approach as shown in Figure HM-21 (refer to Volume 9 - Hydrologic Section). From the data it is seen that this solution predicts a low value of transmissivity. It is believed that the other predictions of transmissivity given above are more accurate and reliable than this estimate because of the reasons discussed in the previous paragraph.

Aquifer transmissivities as determined by the methods listed above range from a low of 6,100 gpd/ft to a high of 35,900 gpd/ft. As a summary of values determined, the following table is provided. The table contains a column identified as "Credibility of Results" which is intended to be a guide to the numbers given. A high credibility rating indicates that the method basically accounts for conditions believed to exist within Rilda Canyon. A medium credibility indicates that the numbers are within

the range expected but that the solution may not be as accurate as another method. A low credibility indicates that, for these conditions, the solution does not appear to fully account for identified field conditions. As outlined in the table, it is believed that long-term transmissivities are on the order of 20,000 gpd/ft and short-term transmissivities are on the order of 35,000 gpd/ft. The variation in results appears to be due to boundary effects created by the canyon walls. If used for further analyses, the short-term transmissivity estimates should govern.

SUMMARY OF CALCULATED TRANSMISSIVITIES							
Analysis Used	Data Type	Well Data Used	Estimated Transmissivity (gpd/ft)		Credibility of Results		
			Short-Term	Long-Term	High	Medium	Low
Cooper-Jacob	Drawdown	P-7	35,650	17,550-21,00	✖		
Cooper-Jacob	Drawdown	P-6		23,600	✖		
Cooper-Jacob	Recovery	P-7	35,900	13,700	✖	✖	
Theis	Drawdown	P-7	28,450	17,900	✖	✖	
Neuman	Drawdown	P-7	13,150	6,100			✖

Quality

Initial water quality investigations (sampling consisted of wells P-1 through P-5 and three spring collection areas) conducted by West Appa Coal Company in the fall of 1982 indicated two distinct classes of groundwater (primarily defined by sulfate concentrations). Illustrated on Figures HF-22, 23, and 24, (refer to Volume 9 - Hydrologic Section), are the percent reacting values for major cations and anions for the five piezometers and three spring collection areas as determined from samples collected on September 16, October 15, and December 6, 1982, respectively. As illustrated on the figures, there are two distinct groupings of data from the various sources with regard to sulfate concentrations and total dissolved solids (TDS) concentrations. In general, the Side Canyon Spring, the South Spring collection zone, and well P-4 contain groundwater higher in TDS and sulfate concentrations than do the North Spring collection zone, wells P-2 and P-5.

Differences in the above-referenced groupings of data reflect differences in the groundwater source or the origin of groundwater for the various springs issuing within the Rilda Springs area. The Side Canyon Spring is located at or near the base of the Blackhawk Formation. The higher sulfate concentrations and TDS concentrations from the spring are characteristic of waters associated with

the Blackhawk Formation. The similarity in water quality between the Side Canyon Spring and the South Spring collection area, Meter 2, would indicate that South Spring waters are also primarily of Blackhawk origin. The slightly better quality of South Spring water over the Side Canyon Spring water indicates that some of the South Spring water is derived from waters moving within the alluvial deposits.

As illustrated by TDS concentrations on Figures HF-22, 23, and 24, (refer to Volume 9 - Hydrologic Section), waters issuing from the North Spring, (Meters 3 and 4), collection area are of a better quality than waters from the Side Canyon and South Spring collection areas. Waters issuing from the North Spring originate primarily from water moving within the alluvial valley sediments and are not derived from the Blackhawk Formation.

Additional water quality sampling conducted by PacifiCorp during 1990 confirmed the early results obtained by West Appa. In summary, water quality of the North Spring does not generally correlate well with waters originating from the south as measured by Meter 1 (Side Canyon) and Meter 2 (South Spring), and are similar to surface waters monitored within Rilda Canyon. The water appears to be more highly correlated with waters moving toward the NEWUA springs from the west. Water movement from the west is most likely through alluvial deposits associated with Right and Left forks of Rilda Canyon. Additional sources may be through faulting and fracturing systems within Rilda Canyon or through the north-south anomaly which passes through the west end of the spring collection system. Extensive exploration conducted in Rilda and Mill Fork canyons parallel to the trend of the fracture systems outlined in earlier reports have failed to identify structual features which could contribute to the groundwater system. The waters originating through the alluvial valley fill appear to have different water quality characteristics than those of the southern springs (refer to Annual Hydrologic Monitoring Reports for a detailed analysis of the water characteristics of the individual springs and Rilda Canyon Creek).

Piezometric Surface

Water level data collected at each of the wells or piezometers within Rilda Canyon has been compiled to indicate the general orientation and direction of groundwater within the vicinity of the NEWUA springs as shown on Map HM-8 (refer to Volume 9 - Hydrologic Section). Note from the map that the general direction of groundwater continues to be to the east along the axis of Rilda Canyon with flow contributions being received by the drainage entering from the south. Water table gradients for the area are dependent upon the time of year as well as overall groundwater recharge characteristics. For example, from the map it can be found that the average slope of the monitored water table lying between wells P-7 and P-5 was 4.3 percent in November 1990. At the same time, the average water table gradient increases downgradient of P-5 where it was found to be 6.4 percent. The fact that the

water table gradient increases downstream of P-5 still tends to confirm the presence of the north-south anomaly, (stratigraphic interface or fracturing). A check of water table gradients during high flow periods shows larger values than were noted in the latter part of 1990. Analysis of historic data shows that, although flow patterns are relatively unchanged during high flow periods, the water table gradient above P-5 may have been as high as 7.4 percent in 1987.

Groundwater Quantity Based on Pump Test Results

An approximation of the total groundwater flow moving eastward down Rilda Canyon was made using data collected from the resistivity studies completed by PacifiCorp and from data collected at local area wells. The flow approximation was made by applying the general flow equation Q=VA. The area of groundwater flow was determined using the inferred cross sectional area identified in the resistivity study as "R-3" (see Map HM-7 Volume 9 - Hydrologic Section) for the canyon adjacent to P-7. The velocity of groundwater movement was determined from the relationship between hydraulic permeability and groundwater gradient, V=ki. Permeability was determined from the estimate for short-term transmissivity obtained using the methods discussed earlier. It was felt that under flow conditions uninfluenced by man, the short-term transmissivity is most representative of natural conditions. Using these relationships, the estimated amount of groundwater moving down Rilda Canyon was determined for both high and low flow conditions.

Based on historic data, low flow conditions were found to dominate during the period of the 1990 pump test; however, it has been noted by PacifiCorp that a rise in water level occurs within Rilda Canyon wells each year as the groundwater aquifer responds to snow melt runoff. Historical data reproduced in Figure HF-25 (refer to Volume 9 - Hydrologic Section) for wells 1 through 5 shows seasonal and annual water level fluctuations. Note the relative change in water level between wells. Little overall variation is noted except for P-3 which shows changes over time totaling approximately thirteen to fourteen (13-14) feet. Changes recorded in P-3 are likely greater than those indicated by Figure HF-25, (refer to Volume 9 - Hydrologic Section) because P-3 is only thirty-eight (38) feet deep and water levels have been known to drop below the bottom of the well. A comparison of water level variations between P-3 and adjacent P-7 indicates that the total water level fluctuation may be as much as twenty-two (22) feet(actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports).

Low Flow. The first condition analyzed was based upon the relatively low flow condition found in November 1990. Using the relationship Q=VA as discussed above, the total alluvial valley aquifer flow in the area of P-7 was estimated to be approximately 151 gpm. Subtracting an average pumped Volume of 16.4 gpm from P-7, an estimated flow of 135 gpm bypassed P-7 and continued downstream toward the NEWUA spring collection system. Impacts noted upon the NEWUA spring system as

a result of pumping P-7 appear to be confined to a reduction in flow from the springs on the order of ten percent. Before pumping began, total combined spring flows were approximately 85 gpm. During the later stages of pumping, just prior to termination of the test, spring flows had reduced to approximately 77.5 gpm, indicating a reduction in flow of 7.5 gpm during the pump test. Additional reductions in flow will probably occur as flows continue to stabilize.

High Flow. High flow conditions were estimated by adding to the 151 gpm base flow calculated for the November 1990 period the additional flow which would move down the canyon given a twenty-two (22) foot rise in water level which would occur during a wet year. The additional flow projected to occur during wet years was estimated by 1) measuring the cross sectional area which would result from a twenty-two (22) foot rise in the water table and 2) by applying the flow relationship Q=kiA. As indicated earlier, the water table gradient (i) used in this equation was found to be greater in 1987 than during the November 1990 test. Based on these assumptions, increased water levels measured during the high flow period of 1987 resulted in an estimated alluvial valley aquifer flow rate of 372 gpm.

B. EXISTING SURFACE RESOURCES

Presented within this section of the report is the regional hydrologic setting as well as the site specific description of hydrologic surface water characteristics of the permit area.

1. REGIONAL AND PERMIT AREA SURFACE WATER HYDROLOGY

The PacifiCorp permit area is located in the headwater region of the San Rafael River Basin (refer to Volume 9 - Hydrologic Section: Figure HF-26). The surface drainage system of the North Rilda permit area is confined exclusively to the Huntington Creek drainage system (refer to Volume 9 - Hydrologic Sction: Map HM-1). Huntington Creek drains approximately 190 square miles of the Wasatch Plateau in central Utah. Altitude changes rapidly across the Wasatch Plateau with steep canyon sides and high mountain peaks. Altitudes range from 6,000 to 10,700 feet. Average precipitation generally increases with altitude and ranges from ten (10) inches near the town of Huntington to thirty (30) inches in the upper reaches of Huntington Creek. Most of the precipitation occurs during winter months in the form of snow.

Water use upstream from Castle Valley (the monoclinal valley containing most of the agricultural land noted in Figure HM-27 [refer to Volume 9 - Hydrologic Section]) is primarily for stock watering and industrial purposes (coal mining and electrical power generation). Within Castle Valley, agriculture and power production utilize nearly all of the inflowing water (Mundorff, 1972) with minimum flows in the gaged streams occasionally approaching zero. Transbasin diversions occur throughout the area.

In general, the chemical quality of water in the headwaters of the San Rafael River Basin is excellent, with these watersheds providing most of the domestic water needs to the people below; however, quality rapidly deteriorates downstream as the streams cross shale formations (particularly the Mancos Shale in and adjacent to Castle Valley) and receive irrigation return flows from lands situated on Mancos-derived soils (Price and Waddell, 1973). Dissolved solids concentrations range from about 100 to 600 mg/l in the mountain regions and from 600 to 6000 mg/l in Castle Valley.

Huntington Creek above the USGS stream gaging station (0318000) near the town of Huntington drains approximately 190 square miles. Storage reservoirs regulate runoff from fifty-four square miles in the upper part of Huntington Creek. The average channel gradient of Huntington Creek above Huntington is about 100 feet per mile (1.9 percent). Danielson et al. (1981) estimate the average annual precipitation on the Huntington Creek drainage to be on the order of twenty-six (26) inches. The average discharge at the USGS gage near Huntington is approximately ninety-six (96) cubic feet per second (70,000 acre-feet per year). The USGS estimates that "during most years, about 65 percent of the annual discharge at the Huntington Creek station (09318000) occurs during the snowmelt period (April-July)" (Danielson et al., 1981, p. 110). For example, the monthly distribution of flows for Huntington Creek near Huntington for the water year 1978, corrected for the influence of Electric Lake Dam, is shown on Figure HF-28 (refer to Volume 9 - Hydrologic Section). The annual peak flows recorded for the USGS station near Huntington are plotted on Figure HM-29. While the majority of stream flows are due to snow melt, thunderstorms of high intensity are common in the area during the summer months. A review of the discharge records for Huntington Creek near Huntington shows that twenty-two of seventy-one (31 percent) measured annual peak flows occurred during July, August, or September. The largest annual peak flows have been caused by thunderstorms. Of the measured annual peak flows on Huntington Creek near Huntington, eight annual events have been greater than 1600 cfs (about a 10-year return period), all of which occurred during July, August, or September. The peak discharge of record was 2500 cfs on August 2 or 3, 1930.

The North Rilda permit area is drained by two drainage systems, Rilda, and Mill Fork canyons (refer to Volume 9 HM-9, included with this submittal). Listed below is the individual breakdown for each individual permit area including stream classification.

MINE PERMIT AREAS	DRAINAGE SYSTEM	STREAM CLASSIFICATION
North Rilda	Rilda	Ephemeral-Perennial
	Mill Fork	Ephemeral-Intermittent

The upper reaches of Rilda and Mill Fork canyons are ephemeral. Rilda Canyon Creek is considered perennial below the springs located along the western border of Section 28, Township 16 South,

Range 7 East, Mill Fork Canyon is intermittent from Section 21, Township 16 South, Range 7 East to the confluence of Huntington Canyon. Most of the streams in the permit area are spring fed. PacifiCorp has monitored all of the surface waters since 1979 and will continue to monitor them in the future. The data collected is included in each annual Hydrologic Monitoring Report.

North Rilda Permit Area Watershed Characteristics

All of the streams within the permit extension boundary are ephemeral-intermittent/perennial, as mentioned earlier. Elevations in the permit area range from approximately 7000 feet to near 10,400 feet. General land slopes in the permit area range from near vertical along the Castlegate escarpment to less than four percent. Vegetative cover consists of sagebrush, juniper, and grasses on the south-facing slopes and dense conifer and aspen complexes on the north-facing slopes.

Water sources within the mine plan area include springs and seeps, which were discussed earlier in the Existing Groundwater Resources section of this report. There are no major water bodies located within or immediately adjacent to the mine plan area.

2. WATER QUALITY AND QUANTITY

PacifiCorp maintains an extensive surface monitoring program to evaluate both quantity and quality of the two major drainage systems which incorporate the permit area. The following will be divided into major and contributing tributary drainage systems.

Huntington Creek Drainage System

a). *Huntington Creek*

Huntington Creek is comprised of many smaller tributary systems that feed the main stream. Rilda and Mill Fork canyon creeks are the only tributaries to Huntington Creek that emanate from within and adjacent to North Rilda permit area.

Huntington Creek flow data are recorded on a continuous basis by UP&L at two locations; one station is located near the Huntington Power Plant, the other below Electric Lake which is about twenty-two miles upstream from the Huntington Plant. Flow records are maintained by UP&L in order to determine water entitlements and reservoir storage allocation for the various users on the river.

The UP&L station near the plant was established in the fall of 1973. Prior flow records were obtained from the USGS station located about one mile downstream from UP&L's existing station. The USGS station was established in 1909 and discontinued in 1970 after determination of available water supply for the Electric Lake Dam. The dam was completed in December 1973, and water storage commenced shortly afterward.

The calculated natural flow rates, which consider actual flow recorded at the plant, plant diversions, Electric Lake storage, and lake evaporation along with yearly comparisons, are reported annually in the Hydrologic Monitoring Report.

Huntington Creek water quality information is compiled on a monthly basis for stations above and below the Huntington Plant, while samples for Huntington Creek below Electric Lake and the Right Fork are taken quarterly. The location of water quality sampling stations on Huntington Creek that were considered for this report are listed below (refer Volume 9 - Hydrologic Section: Map HM-1).

Below Electric Lake+*
Above the Forks+*
Below the Power Plant Diversion*
Below the Power Plant*

+ Not listed on map due to scale
* The sites listed above are not considered part of PacifiCorp's Hydrologic Monitoring Program but will be included in the annual report as long as data is available.

In addition to the sites monitored by Huntington Plant-Environmental Service, three sites were added on Huntington Creek near the Deer Creek confluence in conjunction with the Deer Creek discharge permit.

Specific water quality data as well as yearly comparisons are reported annually in the Hydrologic Monitoring Report. This practice will continue throughout the life of the permit.

In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics because of the lake effect, but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

b). *Rilda Canyon Creek*

Rilda Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule refer to Volume 9 Appendix A~~included herein~~).

Locations:

(1). Right Fork of Rilda - RCF1*
(2). Left Fork of Rilda - RCLF1 (Field data only)
(3). Left Fork of Rilda - RCLF2 (Field data only)
(4). Rilda Canyon - RCF2 (Field data only)
(5). Rilda Canyon - RCF3
(6). Rilda Canyon - RCW4 (Map HM-1, Volume 9 - Hydrologic Section and; Volume 9 Map HM-10~~, included with this submittal~~).

* During mining of the North Rilda leases, an additional site has been added upstream of RCF1 (adjacent to EM-163) to monitor surface/groundwater flow relationships. Flow will be measured yearly during base flow conditions.

Flow information is collected during the first or second week of each month. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in June 1989. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, i.e., RCF3 and RCW4, monthly in conjunction with quantity measurements. Data regarding flow in Rilda Canyon Creek is presented in the annual Hydrologic Monitoring Report.

As stated above, flow information is collected monthly throughout the year with the use of three Parshall flumes and one V-notch weir (Volume 9 - Hydrologic Section: Map HM-1). Hydrographs comparing yearly flows are reported in the annual Hydrologic Monitoring Report and also as Figure HF-33 Volume 9 - Hydrologic Section: Map HM-1.

In accordance with the Hydrologic Monitoring Plan baseline quality analysis will be for a two-year period, 1989-90 (refer to the respective Annual Hydrologic reports). Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1989; results of the samples collected are presented in Table HT-7, (Volume 9 - Hydrologic Section: Map HM-1), and in the Hydrologic Monitoring Report.

c. *Mill Fork Canyon Creek*

Mill Fork Canyon Creek is a tributary of Huntington Creek and was included in PacifiCorp's monitoring program starting in 1997. Monitoring of Mill Fork will be conducted according to the following schedule (see Hydrologic Monitoring Schedule refer to Volume 9 Appendix A~~included herein~~).

Locations:

(1). Above old mines - MFA1
(2). Mill Fork Canyon Culvert - MFB2 (Volume 9 - Hydrologic Section).

Flow information is collected during the first or second week of each month. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. The program was initiated in 1997. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, monthly in conjunction with quantity measurements. Data regarding flow in Mill Fork Canyon Creek is presented in the annual Hydrologic Monitoring Report.

As stated above, flow information is collected monthly throughout the year (Volume 9 - Hydrologic Section: Map HM-1). Hydrographs comparing annual flows are reported in the annual Hydrologic Monitoring Report.

Historical monitoring data collected by Beaver Creek Coal Company - No. 4 Mine and the United States Geological Survey (site No. 76: Open File Report 81-539) has been incorporated in PacifiCorp's hydrologic database. Operational water quality monitoring was conducted during 1997 and 1998 (refer to the Quarterly Hydrologic submittals). Baseline quality analysis was initiated in November 1998. In accordance with the Hydrologic Monitoring Plan, baseline quality analysis will conducted be for a two-year period, forth quarter 1998 - fourth quarter 2000 (refer to the respective Annual Hydrologic reports). Thereafter, baseline analysis will be repeated once every five (5) years.

3. SOIL LOSS AND SEDIMENT YIELD

Sediment load concentrations in the area of the permit vary dramatically depending on the percentage of disturbed areas, ruggedness of the terrain, geologic formations present, the amount of precipitation the area receives, and stream flow volume.

As part of the U.S. Geological Survey water monitoring program in Utah coal fields (Open File Report #81-359), fourteen water samples associated with the permit area were collected between August 1978 and September 1979 at gaging station 09318000 on Huntington Creek to determine suspended-sediment concentrations and loads. Three samples each were collected at gaging stations 09317919, 09317920, and 09324200 in Crandall and Tie Fork canyons. Five additional samples were collected by project personnel from these and other streams in the study area. Representative suspended-sediment concentrations and loads of streams in the study area are listed below.

		Suspended Sediment		
Stream	**Site No.**	**Date**	**Concentration (mg/l)**	**Load (tons/day)**
Huntington Creek (gaging station 09318000)	88	8/13/78	104	27.00
		11/17/78	72	2.50
		6/13/79	114	66.00
		8/7/79	44	15.00
Crandall Creek (gaging station 09317919)	51	8/12/78	49	0.14
		11/18/78	60	0.08
		6/14/79	15	0.41
		8/6/79	56	0.15
Tie Fork Canyon	67	8/13/78	12	0.03
		11/18/78	57	0.12
		6/14/79	38	0.68
		8/6/79	66	0.17
Bear Creek	81	10/25/78	8860	1.90
Deer Creek	87	6/14/79	609	3.10

As indicated from the samples collected by the USGS, the suspended-sediment concentrations varied widely among the drainages analyzed. The relatively low concentrations of suspended sediment were attributed to well established channels, low flow periods, and a scarcity of roads. Higher concentrations appeared to be associated with the activities of man and erosion of large exposures of the Mancos Shale formation in the lower reaches of the drainages. Sediment concentrations generally increased

with increased stream discharge. Note that the highest values at all of the locations occurred during the spring runoff period, but not enough data were available to compute daily sediment discharge.

PacifiCorp has collected samples on a quarterly basis from the streams within and adjacent to the permit area. Samples taken at periods of both high and low flow have been tested for total suspended solids (TSS) to identify stream stability and are reported annually in the Hydrologic Monitoring Report. Tables HT-5 through HT-8 show the TSS results for streams monitored by PacifiCorp (refer to Volume 9 - Hydrologic Section).

R645-301-723 SAMPLING AND ANALYSIS

Water quality sampling and analysis of samples collected by PacifiCorp will be done according to the "Standard Methods for the Examination of Water and Wastewater." Refer to Volume 9 Appendix A for sample documentation and analytical methods and detection ~~limits (refer to Volume 9 - Hydrologic Section)~~.

R645-301-724 BASELINE INFORMATION

PacifiCorp maintains an extensive groundwater and surface monitoring program to characterize pre-mining and any mining-related impacts both to quality and quantity. As an integral part of the permit application, an annual Hydrologic Monitoring Report is prepared by PacifiCorp and submitted to appropriate government agencies. Baseline information for the East Mountain property will be divided into the following categories: 1) Groundwater, and 2) Surface Water.

Groundwater

The characteristics of the groundwater resource are dependent upon the geology of the water-bearing strata and on the geology and hydrology of the recharge area. Groundwater movement and storage characteristics are dependent on the characteristics of the substratum. To characterize the baseline quality and to document the existence of seasonal variations, PacifiCorp developed a groundwater monitoring program which includes sampling both surface springs and in-mine groundwater sources. The program was initiated during a period from 1977 through 1979. Routine monitoring continues to support the quality data collected during the initial phase. In general, data from the springs and in-mine sources are representative of the groundwater quality in the geologic strata from which the groundwater sources issue. Cation-anion diagrams have been utilized to depict the groundwater characteristics and to monitor quality trends. Results of the data collected have shown that, in both

the surface springs and in-mine groundwater sources, variations in quality from individual sources do exist, but the quality from the individual sources remains consistent with time. Spring water is mostly calcium-bicarbonate with some magnesium and sulfate. As discussed in the General Requirement Section - R645-301-711, quality decreases with increasing downward vertical movement and from north to south with sulfate becoming a major constituent. Cation-anion diagrams have been included in the Annual Hydrologic Reports to support the lack of seasonal variation. A copy of the 1991 quality information is included in Volume 9 - Hydrologic Support Information, Baseline Section (additional information concerning groundwater quality can be found in the Annual Hydrologic reports).

Surface Water

The North Rilda permit area is drained by two drainage systems: Rilda Canyon, and Mill Fork Canyon. PacifiCorp has documented that all of the stream reaches emanating from within the North Rilda permit area with the exception of the lower portion Rilda Canyon creek cease flowing in the fall or winter, suggesting that they are not perennial but ephemeral/intermittent. Flow in the drainage is a combination of snow melt and springs. Most of the runoff occurs during the months of April through July. Even though the drainage systems are ephemeral, except for the lower reaches of Rilda Canyon, variations in quality do exist. Total dissolved solids increase gradually in concentration as flow proceeds from the upper plateau areas to the confluences of the major drainage of Huntington Canyon. Surface waters in the mine permit extension area are predominantly bicarbonate, calcium, and magnesium in the upper reaches with sulfate becoming a major constituent in the lower reaches. The increase in sulfate concentration is due to the influence of the Mancos Shale, a marine shale which outcrops in the lower reach of each of the drainage systems. Seasonal total suspended solids variations also occur with the highest concentrations occurring during the initial runoff period. A annual summary sheet for each drainage is included in Volume 9 - Hydrologic Support Information, Baseline Section.

R645-301-724.100 GROUNDWATER INFORMATION

A detailed description of the ownership of existing wells, springs, and other groundwater resources, including seasonal quality and quantity of groundwater and usage, is given in sections R645-301-721 and 722.

R645-301-724.200 SURFACE WATER INFORMATION

A detailed description of all surface water bodies, i.e., streams and lakes, including quality, quantity, and usage is given in section R645-301-711.

R645-301-724.300 GEOLOGIC INFORMATION

Applicable geologic information can be referenced in the Geologic section of the MRP.

R645-301-724.400 CLIMATOLOGICAL INFORMATION

PacifiCorp operates a network of weather stations, including two at low elevations (Hunter and Huntington power plants) and two at high elevations (Electric Lake and East Mountain).

Precipitation

The climate of the permit area has been described by the U.S. Geological Survey, which states that it is semi-arid to subhumid and precipitation generally increases with altitude. The average annual precipitation ranges from about ten (10) inches in the lowest parts of the permit area (southeast) to more than twenty-five (25) inches in the highest parts (northwest). PacifiCorp's weather station, located in Section 26, Township 17 South, Range 7 East, has provided data which shows that the summer precipitation in the form of thundershowers averages about the same as the winter precipitation in the form of snowfall. Because much of the summer precipitation runs off without infiltration, the winter precipitation has the greatest impact on groundwater.

Precipitation amounts have been and will continue to be recorded at the Hunter and Huntington power plants, at Electric Lake Dam, and on East Mountain. Precipitation data can be found in the annual Hydrologic Monitoring Report (refer to Volume 9 - Hydrologic Section: Table HT-9 for East Mountain data).

Temperatures

Air temperatures vary considerably both diurnally and annually throughout the permit area Midsummer daytime temperatures in lower areas commonly exceed 100° F, and midwinter nighttime temperatures throughout the area commonly are well below 0° F. The summer temperatures are accompanied by large evaporation rates. Although not recorded, there probably also is significant sublimation of the winter snowpack, particularly in the higher plateaus which are unprotected from dry winds common to the region. Temperature information is collected at the UP&L weather stations at each power plant, at Electric Lake, and on East Mountain. These data will continue to be included in the annual Hydrologic Monitoring Report (refer to Volume 9 - Hydrologic Section: Table HT-9 for East Mountain data).

Winds

The winds in the area are generally variable. The wind rose presented in Figure HF-36 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) displays the variability for the Meetinghouse Ridge area for January to December 1978.

R645-301-724.600 SURVEY OF RENEWABLE RESOURCES LANDS

Information describing the existing groundwater resources, including descriptions of permit area aquifers and areas of recharge can be found in section R645-301-721. Impacts related to mine subsidence can be found in section R645-301-728.

R645-301-724.700 ALLUVIAL VALLEY FLOORS

Utah Regulations require that the presence of alluvial valley floors in or adjacent to the mine project area be identified. A detailed description of the alluvial valley floor deposits were described in the "REGIONAL GROUNDWATER CHARACTERISTICS" (refer to Volume 9 - Hydrologic Section).

R645-301-725 BASELINE CUMULATIVE IMPACT AREA INFORMATION

Hydrologic and geologic data required to assess the probable cumulative impacts of the coal mining and reclamation activities are presented in the Hydrologic (including the Annual Hydrologic reports), Operational, and Reclamation sections of the permit applications.

R645-301-728 PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION

Probable hydrologic consequence determinations are based on extensive investigations conducted to determine existing groundwater and surface water resources along with ongoing hydrologic research and comprehensive monitoring programs including hydrologic and subsidence. Data utilized to arrive at the conclusions presented in this section were discussed earlier (see Section R645-301-711), and specific information pertaining to impacts to the hydrologic balance will be discussed under the appropriate section.

Description of the Mining Operation

The North Rilda permit area is located in the central portion of the Wasatch Plateau coal field in Emery County, Utah. Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. Much data has been collected regarding the geology and the hydrology of the East Mountain property. In all, over 120 drill holes have been completed from the surface, over 500 from within the mines; and a comprehensive hydrologic data collection program is ongoing, all of which have provided data used in this PHC. The most applicable data have been included in this document. For a review of additional data it is suggested that the reader refer to the annual Hydrologic Monitoring Report.

Geology

A detailed description of the geology (structure and stratigraphy) has been presented in a previous section and will not be duplicated here. (Refer to R645-301-711).

Mining Methods

Mining of the North Rilda permit area will be conducted entirely by underground mining methods consisting of continuous miner and longwall techniques. Two minable coal seams exist within the property. In ascending order they are the Hiawatha and Blind Canyon (see operational plans of each separate permit application).

The chemical and physical properties of the overburden have been identified and described in the Geologic section (refer to Volume 8 and R645-301-600 Geology Section of this volume).

Because mining is limited to underground mining techniques, only minor amounts of overburden directly in contact with the seam, either roof or floor, will be removed during mining operations.

Surface Water System

A detailed description of the regional and permit area surface water resources has been presented in previous sections and will not be duplicated here. (Refer to R645-301-722). In general, the surface drainage system of the North Rilda area is divided into two drainages; the southern portion forms part of Rilda Canyon Creek, and the northern portion contributes to Mill Fork Canyon. The Rilda Canyon drainage covers seventy-four percent (74%) of the North Rilda leases held by PacifiCorp. PacifiCorp has observed that all of the streams reaches emanating from within the permit boundary, with the exception of the lower portion of Rilda Canyon Creek, cease flowing in the fall or winter and periods of drought, suggesting that they are not perennial but ephemeral/intermittent. Rilda Canyon Creek is perennial below the springs located along the western border of Section 28, Township 16

South, Range 7 East, as it flows year round there. Most of the streams are spring fed. PacifiCorp has monitored all of the surface waters since 1989 and will continue to monitor them in the future (Mill Fork Canyon was monitored in the past by Beaver Creek Coal Company). The data collected is included in each annual Hydrologic Monitoring Report.

Impacts to surface water due to the underground operations of Deer Creek - North Rilda area will be minor, both in terms of quality and quantity. Due to the type of mining and no surface disturbance, surface water impacts are limited. A detailed analysis of the associated impacts is described in the Hydrologic Balance section below.

Hydrologic Balance - Surface Water System

As mentioned previously in this report, the drainages conveying runoff away from the permit areas are streams in Rilda, and Mill Fork canyons. Second mining, ie. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the Right Fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence / long term stability" design of the 5th North Mains development within the area of the right fork of Rilda and the long-term stability analysis refer to the Engineering Section R645-301-500 Appendix 1. To protect the alluvial/colluvial system of the right fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

The angle of draw of subsidence produced by full-extraction mining can be influenced by many factors. These include the size of the area mined, number of seams mined, fractures or faults in the overburden, adjacent mine workings, and adjacent areas of burned coal and clinker. If mine workings extend to an area of burned coal, experience has shown that the overburden stresses above the mined area can be transferred to the adjacent burned coal and clinkers which can cause the clinkered areas to fail. In this case, the angle of draw may appear to be very shallow, when the crushing of the clinkered areas are the source of subsidence outside the normal area of influence.

Faults can also influence the angle of draw. If mining occurs adjacent to an existing fault, the area of subsidence will follow the natural plane of weakness formed by the fault. In this case, the angle of draw will be the same as the dip of the fault.

Based on data collected by the U.S. Bureau of Mines and eighteen years of subsidence data collection on East and Trail mountains, the angle of draw is found to be between 0 and 15 degrees from vertical. In some limited areas, the angle of draw is greater than 15 degrees, but in every case, the angle is greater due to the influence of one of the other factors mentioned above.

For planning purposes, any barrier of protection left in the mine to protect surface features should use a 15 degree angle of draw unless one of the factors mentioned above is known to exist in the immediate area.

In the majority of cases, cracking due to subsidence is not anticipated to extend to the surface; therefore, surface runoff patterns will not be significantly affected. Data collected by PacifiCorp over a eighteen-year period concerning subsidence and surface drainages has not detected any surface stream impacts. Consequently, subsidence should not cause significant impacts to the surface water system.

Underground coal mines in the Wasatch Plateau coal field typically intersect groundwater from strata surrounding the coal seams. Both Deer Creek and Wilberg/Cottonwood mines have intersected quantities of water in excess of operational needs and therefore have discharged intercepted groundwater. Dewatering of Deer Creek has had only a minor impact on surface quality and quantity on a regional basis; however, on a site specific basis the flow in Deer Creek has increased from pre-mining conditions. During periods of high runoff changes in quality are insignificant; however, in low flow conditions some degradation is likely due to the fact that the mine discharge waters are higher in TDS than the surface waters. It is difficult to assess the degradation because it is not known from where or how much of the water discharged from the mine would naturally have been discharged into the receiving streams by natural groundwater flow. The section below will describe the dewatering of Deer Creek area and related surface impacts.

Excess water not utilized in the mining operation or for domestic use is either pumped to storage areas or discharged from the mine at the Deer Creek portals. (Quality and quantity is reported in the Annual Hydrologic Report.) Flow meters are utilized to record the amount of water discharged from the mine, after which it passes through underground sedimentation sumps (refer to Volume 9 - Hydrologic Section: Figure HF-38).

Mitigation and Control Plans

~~No surface disturbance will be assoicated with the extension of the Deer Creek Mine to the North Rilda area.~~ Any mine discharge will be routed through the underground sediment pond, reservoirs in the old workings or specialized sump areas and discharged at the Deer Creek Mine portals located in Deer Creek Canyon.~~will be~~ Monitoring will be in accordance with UPDES permit standards and state and federal regulations. (refer to Volume 9 - Hydrologic Section: Appendix B for UPDES permit information.)

The effects of the mining operation on the surface water system will be analyzed through the surface water monitoring plan described below. In the event that monitoring shows that the surface water system is being adversely affected by mining activities, additional steps will be taken to rectify said impacts in cooperation with local, state, and federal regulatory agencies.

Surface Monitoring Plan

A hydrologic surface monitoring program, initiated in 1979 (sites in Meetinghouse and Rilda canyons were added in 1986 and 1989, respectively, [Mill Fork Canyon was monitored by Mountain Coal Company from 1984-95 and was included in PacifiCorp's hydrologic monitoring in 1997]), has been underway at each of the surface monitoring stations shown on Map HM-1 (refer to Volume 9 - Hydrologic Section). An additional surface site was added in 1997 in Rilda Canyon in the right fork above the proposed mainline development to monitor the surface/groundwater relationship of the right fork. Stations were established to monitor water quality and quantity above and below the mine permit areas. The parameters for laboratory analyses are those established by DOGM in "Guidelines for Surface Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A). Once baseline data have been collected (two-year period), the surface sites described in the hydrologic monitoring schedule in Appendix A will continue to be monitored quarterly (when accessible) throughout the operational phase of the mine. The quarterly monitoring during the mine operational phase will include flow and quality to delineate seasonal variation and assess changes in water quality.

Future data may show that modifications of the monitoring schedule are justified. Any changes to the monitoring schedule (frequency or parameters) will be made only with the approval of DOGM. Results of all water quality data will be submitted to that agency quarterly, with an annual summary.

Post-mining monitoring of surface water will continue at representative stations determined with the aid and approval of DOGM. Representative surface water stations will be monitored biannually during high and low flow conditions. Monitoring will continue until the release of the reclamation bond or until an earlier date to be determined after appropriate consultation with local, state, and federal agencies.

Groundwater System

PacifiCorp has collected an extensive database of information pertaining to the groundwater quality and quantities of the East Mountain region and adjacent areas. Included in the database is long-term quality and flow information both for springs and for groundwater intercepted by mining.

Detailed descriptions of the regional and permit area groundwater resources have been presented in previous sections and will not be duplicated here (refer to R645-301-722). In general, the majority of all natural groundwater discharge points located on the East Mountain property are in the form of seeps and springs. PacifiCorp has mapped approximately eighty (80) springs ranging in discharge from <1 gpm to as high as 450 gpm (refer to Volume 9 - Hydrologic Section: Map HM-4).

The USGS has conducted extensive studies to determine the regional groundwater system for the central Wasatch Plateau Coal Field. The studies indicate a regional aquifer exists in the coal-bearing sequence of the Blackhawk and the underlying Star Point Sandstone formations. The studies have also concluded that several isolated or perched aquifers existed above the Blackhawk-Starpoint aquifer. PacifiCorp agrees with conclusions of the USGS studies concerning the perched aquifers above the coal-bearing sequence of the Blackhawk Formation but has some reservations about the significance of the Blackhawk-Starpoint aquifer which will be discussed below. The majority of the groundwater is discharged from the perched aquifers which occur along the base of the North Horn Formation in the form of seeps and springs (refer to Volume 9 - Hydrologic Section: Map HM-4, Figure HF-6, and Table HT-1). Several other perched aquifers exist mainly along the formational contacts with the North Horn Formation, including the upper contact with the Flagstaff Limestone and the lower contact with the Price River Formation.

The majority of the groundwater recharge on East Mountain comes from the winter snowpack which melts and infiltrates into the surface of East Mountain. The water flows down vertical fractures which intersect sandstone channel systems in the North Horn Formation. The majority of the groundwater reaching this point intersects the surface in springs located in the North Horn Formation. Very little recharge intersects the upper Price River Formation and Castlegate Sandstone; consequently, they are not water saturated where intersected in the numerous drill holes penetrating those units. As discussed earlier in the Groundwater Section, recharge to the North Rilda area is very limited due to the topographic configuration of the region (refer to Volume 9 Map HM-9, included with this submittal).

The hydrogeologic characteristics of the coal-bearing Blackhawk and overlying formations effectively limit the extent of impacts to the hydrologic system. Impacts to water quality are negligible and may be slightly beneficial. As discussed previously, two separate aquifers-water bearing zones occur on the East Mountain property: 1) perched aquifers associated mainly with the North Horn Formation,

and 2) Blackhawk-Starpoint regional aquifer, which exhibits limited potential as a property wide, water saturated zone. The following hydrologic balance section will segregate the two zones and describe the significance and possible impacts to each zone.

Hydrologic Balance - Groundwater

Mining within the North Rilda area will have negligible impact on the regional hydrologic balance, but there could be some possible local impact. This section discusses the possible mining-related impact on the hydrologic balance due to:

A. Subsidence - Perched Aquifer Systems,
B. Mining in the Rilda Canyon Area - NEWUA Springs, and
C. Interception of Groundwater by Mine Workings
D. Mining Below the Right Fork of Rilda Canyon
E. Mill Fork State Lease ML-48258 Access (Hiawatha Seam)

A. SUBSIDENCE: PERCHED AQUIFER SYSTEMS ABOVE THE MINE HORIZON

As discussed earlier, most of the groundwater in the permit and adjacent areas discharges in the form of seeps and springs. No springs will be undermined in the North Rilda area. Only two springs are within the North Rilda permit area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 map HM-9 ~~included with this submittal~~ for the location of the springs and Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix A for sampling sites and monitoring schedule). A Spring Geologic Conditions Inventory sheet has been completed for each spring inventoried on the East Mountain Property and can be found in Volume 9 - Hydrologic Support Information.

PacifiCorp has conducted a series of exploration programs to identify the geologic and hydrologic characteristics of the North Rilda area including the proposed crossing of the right fork of Rilda Canyon (refer to Volume 9 Map HM-10 ~~included within this submittal~~). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial\bedrock interface. Mainline development below the Right Fork of Rilda Canyon did not intercept any groundwater, and has remained "dry" since initial development.

To identify any mining related impacts PacifiCorp monitors a significant number of springs which have been undermined or will be undermined within the next five years (refer to Volume 9 - Hydrologic

Section: Hydrologic Monitoring Schedule and Map HM-5). A field verification meeting will be held each year with the government agencies involved to determine if changes in the springs monitored are required. Each year in the annual Hydrologic Monitoring Report spring flow rates are compared to East Mountain climatology as to how closely spring discharge follows local annual precipitation or to verify any mining related impacts.

Data collected by PacifiCorp continues to show the relationship between the variation in groundwater discharge quantity and precipitation. Hydrologic monitoring completed on the East Mountain property has failed to identify any changes in the quantity or quality of groundwater discharge from the springs which have been undermined. The U.S. Bureau of Mines completed an independent study (1994) of the mining impacts on the Hydrology of East Mountain (Response of Springs to Longwall Coal Mining at the Deer Creek and Cottonwood Mines, Wasatch Plateau, UT. Informational Circular 9405, U.S. Bureau of Mines). PacifiCorp personnel collected the data in this study from springs determined to represent hydrologic conditions on East Mountain. This determination was made by an ad hoc committtee including representatives of DOGM and the Forest Service. This study failed to find any springs that have been impacted by mining (refer to 645-301-700: Appendix 1).

B. MINING IN THE RILDA CANYON AREA-NEWUA SPRINGS

As discussed in R645-301-721, North Emery Water Users Association (NEWUA), a major concern to PacifiCorp is the proximity of proposed mining activities in Rilda Canyon to the Rilda Canyon springs.

PacifiCorp contracted Hansen, Allen & Luce (HA&L) to conduct a hydrologic test in Rilda Canyon. (Refer to Volume 9 - Hydrologic Support Information, Rilda Canyon Pump Test.) The findings from this test were then compared to the Wellhead/Drinking Water Source Protection criteria to determine the appropriate mitigation measures. The local groundwater system in the vicinity of the NEWUA springs consists of an unconfined alluvial valley fill aquifer as well as bedrock and fracture systems. Resistivity data provided by PacifiCorp indicate that the total maximum depth of alluvium ranges from 50 to 73 feet at the three locations where cross sections were taken. The locations of the resistivity cross sections within Rilda Canyon are shown on Map HM-7 (refer to Volume 9 - Hydrologic Section). The width of the unconfined aquifer varies due to the influence of side drainages which also feed the area.

Water moving throughout Rilda Canyon appears to originate mainly from the alluvial deposits assoicated with the right and left forks of Rilda Canyon. Earlier studies indicated two other potential sources; an east-west trending fault which is believed to lie to the north of the canyon floor, and the third is potentially through a north-south trending fault which bisects the canyon just west of the NEWUA spring collection system. Extensive surface exploration conducted in Rilda and Mill Fork canyons

parallel to the trend have failed to identify structural features which would contribute to the groundwater system.

Springs within Rilda Canyon are believed to indicate and verify the locations of changes in stratigraphy. Examples of local stratigraphy and their impact on hydrology have been verified historically through stream and spring flow observations. The canyon drainage west (or above) the interface with the upper contact of the Star Point Sandstone is generally a discharging stream section. When alluvial waters come in contact with the more impermeable members of the upper Star Point Sandstone formation, they are often forced to the surface, creating springs. Local NEWUA springs confirm a recharging stream section. When these more impermeable formations are crossed, the stream once more becomes a losing stream until subsurface waters again come in contact with the more impermeable members of the Star Point Sandstone and underlying Mancos Shale formations. Some sections of the stream within Rilda Canyon gain flow, thereby evidencing the locations where subsurface water is forced to the surface by the tighter formations.

Data collected during and following the pump test of Well P-7 were used to provide estimates of local valley fill aquifer characteristics. For these analyses, data from both pumped P-7 and from observation Well P-6 during both the drawdown and recovery portions of the test were used.

Aquifer transmissivities as determined by the methods described in R645-301-721 range from a low of 6,100 gpd/ft to a high of 35,900 gpd/ft. As a summary of values determined, the following table is provided. The table contains a column identified as "Credibility of Results" which is intended to be a guide to the numbers given. A high credibility rating indicates that the method basically accounts for conditions believed to exist within Rilda Canyon. A medium credibility indicates that, for these conditions, the solution does not appear to fully account for identified field conditions. As outlined in the table, it is believed that long-term transmissivities are on the order of 20,000 gpd/ft and short-term transmissivities are on the order of 35,000 gpd/ft. The variation in results appears to be due to boundary effects created by the canyon walls. If used for further analyses, the short-term transmissivity estimates should govern.

SUMMARY OF CALCULATED TRANSMISSIVITIES							
Analysis Used	Data Type	Well Data Used	Estimated Transmissivity (gpd/ft)		Credibility of Results		
			Short-Term	Long-Term	High	Medium	Low
Cooper-Jacob	Drawdown	P-7	35,650	17,550-21,00	✖		
Cooper-Jacob	Drawdown	P-6		23,600	✖		
Cooper-Jacob	Recovery	P-7	35,900	13,700	✖	✖	
Theis	Drawdown	P-7	28,450	17,900	✖	✖	
Neuman	Drawdown	P-7	13,150	6,100			✖

Groundwater Quantity Based on Pump Test Results

An approximation of the total groundwater flow moving eastward down Rilda Canyon was made using data collected from the resistivity studies completed by PacifiCorp and from data collected at local area wells. The flow approximation was made by applying the general flow equation Q=VA. The area of groundwater flow was determined using the inferred cross sectional area identified in the resistivity study as "R-3" (refer to Volume 9 - Hydrologic Section: Map HM-7) for the canyon adjacent to P-7. The velocity of groundwater movement was determined from the relationship between hydraulic permeability and groundwater gradient, V=ki. Permeability was determined from the estimate for short-term transmissivity obtained using the methods discussed earlier. It was felt that under flow conditions uninfluenced by man, the short-term transmissivity is most representative of natural conditions. Using these relationships, the estimated amount of groundwater moving down Rilda Canyon was determined for both high and low flow conditions.

Based on historic data, low flow conditions were found to dominate during the period of the 1990 pump test; however, it has been noted by PacifiCorp employees that a rise in water level occurs within Rilda Canyon wells each year as the groundwater aquifer responds to snow melt runoff. Historical data reproduced in Figure HF-25 for wells 1 through 5 shows seasonal and annual water level fluctuations (refer to Volume 9 - Hydrologic Section). Note the relative change in water level between wells. Little overall variation is noted except for P-3 which shows changes over time totaling approximately thirteen to fourteen (13-14) feet. Changes recorded in P-3 are likely greater than those indicated by Figure HF-25 because P-3 is only thirty-eight (38) feet deep and water levels have been known to drop below the bottom of the well. A comparison of water level variations between P-3

and adjacent P-7 indicates that the total water level fluctuation may be as much as twenty-two (22) feet, (actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports).

Low Flow. The first condition analyzed was based upon the relatively low flow condition found in November 1990. Using the relationship Q=VA as discussed above, the total alluvial valley aquifer flow in the area of P-7 was estimated to be approximately 151 gpm. Subtracting an average pumped Volume of 16.4 gpm from P-7, an estimated flow of 135 gpm bypassed P-7 and continued downstream toward the NEWUA spring collection system. Impacts noted upon the NEWUA spring system as a result of pumping P-7 appear to be confined to a reduction in flow from the springs on the order of ten percent. Before pumping began, total combined spring flows were approximately 85 gpm. During the later stages of pumping, just prior to termination of the test, spring flows had reduced to approximately 77.5 gpm, indicating a reduction in flow of 7.5 gpm during the pump test. Additional reductions in flow will probably occur as flows continue to stabilize.

As stated above, not all the water moving down Rilda Canyon in the alluvial valley aquifer was collected through pumping of P-7. In order to obtain an estimate of the total possible impact should the entire alluvial aquifer be eliminated as a source of water, a straight line extrapolation was made of pumped flows versus decreased spring flows. A straight line extrapolation of the data in this fashion should be considered an approximation only, not an accurate method of determining precise impacts. At an average pump rate of 16.4 gpm at P-7, NEWUA spring flows decreased by approximately ten percent. Assuming all alluvial valley recharge bypassing P-7 was eliminated as a potential source of water, the estimated impact to the NEWUA springs (using the straight line extrapolation method) could be approximately 69 gpm. The estimated spring impact based in percent would then be 69 gpm over an uninfluenced flow rate of 85 gpm or eighty-one percent. Using this methodology, the remaining nineteen percent of the flow contributing to the NEWUA springs appears to be coming from other sources.

High Flow. High flow conditions were estimated by adding to the 151 gpm base flow calculated for the November 1990 period the additional flow which would move down the canyon given a twenty-two (22) foot rise in water level which would occur during a wet year (actual data collected from 1990 through 1996 reveals the maximum rise in water level of approximately twenty eight [28] feet, refer to Annual Hydrologic Monitoring Reports). The additional flow projected to occur during wet years was estimated by 1) measuring the cross sectional area which would result from a twenty-two (22) foot rise in the water table and 2) by applying the flow relationship Q=kiA. As indicated earlier, the water table gradient (I) used in this equation was found to be greater in 1987 than during the November 1990 test. Based on these assumptions, increased water levels measured during the high flow period of 1987 resulted in an estimated alluvial valley aquifer flow rate of 372 gpm.

Data shows that total NEWUA spring flow during high flow periods is typically on the order of 400 gpm (refer to Volume 9 - Hydrologic Section: Figure HF-11). If all alluvial flow entered the springs, then the total impact to the springs resulting from the loss of said flow would be on the order of ninety-three percent (372 gpm/400 gpm). An alternate method of approximating the potential impact is through the use of the same impact ratio as was determined from the low flow pump test completed on P-7. Using this method, the total expected decrease in spring flows during high flow periods would be approximately 170 gpm, or a forty-three percent decrease (170 gpm expected decrease/400 gpm total spring flow).

Wellhead/Drinking Water Source Protection

The State of Utah has been required by the federal government under the Federal Safe Drinking Water Act to establish a Wellhead Protection Program to protect groundwater that supply drinking water to public water supply systems. Included in this classification is the NEWUA spring collection system within Rilda Canyon. During the time frame of the NEWUA springs investiagation, (1989-90), the wellhead protection rules were in draft form and were being considered for adoption by the Utah Safe Drinking Water Committee. A brief summary of the proposed draft rules is included as Table HT-11 (refer to Volume 9 - Hydrologic Section). The wellhead protection rules were adopted by the Utah Safe Drinking Water Committee and referred to as the *"DRINKING WATER SOURCE PROTECTION"* rules, R309-113, on July 26, 1993. Delineation of protection zones and management areas remained unchanged from the draft guidelines listed in Table HT-11 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP).

Based upon information contained in the table, it appears that the property included within Zone 1, a 100-foot radius around the NEWUA spring collection system, should be owned by the water supplier and be fenced. In addition, Zone 1 should be protected against anthropogenic sources of contamination. The "Master List of Potential Anthropogenic Sources of Contamination in Utah" as given in R449-113-8.1 includes coal companies within the designation, "Concrete, asphalt, tar and coal companies." Note the designation difference between new and existing sources in the table just discussed in that "new sources" indicates a definitive action whereas "existing sources" indicates that the action "should" be done. This distinction implies that existing facilities will be treated with more latitude than new facilities. It appears that this wording has been added to take into account the many possible configurations of public water supplies wherein little can be done to modify or correct long standing conditions.

Because the area has a characteristically high groundwater velocity, the criteria identified by zones 2 and 3 in the table do not apply. For example, a 250-day travel time for water found within the alluvial aquifer (using a permeability of 167 ft/day as estimated by the pump test results) would be 7.9 miles. Since the criteria require that the zone not extend beyond the natural hydrologic boundaries, the zone

is reduced to the limit or extent of the canyon in which the NEWUA springs are located. Using this criteria, the north and south limits would include the land to the ridgeline of Rilda Canyon. The west boundary line would be placed at a two mile radius from the NEWUA spring collection system, and the east boundary would be located along the contour line 100 feet lower in elevation from the groundwater source. A map showing the approximate groundwater protection zone boundary as defined by the preliminary draft regulation is presented in Figure HF-41 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). It should be noted that this boundary is only an approximation of the two mile radial zone as defined in the regulation, and refinement will be needed as the regulation is further defined.

Spring Impacts

Impacts noted on NEWUA springs during the pump test completed in November 1990 were found to be in the range of approximately ten percent. The impacts are based upon the pump test, water level data collected from P-7, other local piezometers, and spring discharge data. Continued pumping beyond the length of the test completed will likely result in additional declines beyond those noted during the seven-day test. The impacts to the springs based upon varying local conditions and flow patterns have been reviewed as a result of this reporting effort. Some of the changes which could potentially occur to the local groundwater system, thereby impacting local springs, are discussed below.

Total Elimination of Alluvial Flow. In the event that all alluvial aquifer flow from the west up Rilda Canyon was eliminated as a spring recharge source, impacts to the NEWUA springs may be more severe than forty-two of the ninety-three percent estimate made through the use of pumping test data. Impacts to the NEWUA springs would be most severe in the event that local alluvial water provides the majority of the head driving the spring collection system during peak periods. Based on the large fluctuations noted in Well P-3 ,(replaced with P-7), this appears to be the case. Other flows, including those related to faults and fractures, may provide a relatively constant base flow to the spring collection system; however, the majority of impact potential to the springs at this time appears to be related to alluvial recharge.

Elimination of Other Sources. Other sources of spring recharge water include fractures as well as alluvial flow in the side canyon located adjacent to the NEWUA springs to the south. Should recharge waters feeding the fractures originate from areas proposed to be mined and mining diverts the water from its natural course, impacts to the springs could be cumulative with those resulting from a reduction of alluvial flow as discussed above. Obviously, under these conditions the impacts will be greater than those estimated herein based upon alluvial flow near P-7 alone.

With the exception of P-3, little seasonal variation was noted in the water level within the wells shown in Figure HF-25 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP). The variation

noted in P-3 is insufficient, however, to account for the total flow variation measured in the NEWUA springs between high and low flow years. High and low flow alluvial recharge from the main canyon area was estimated earlier to be approximately 372 and 151 gpm, respectively. The increase in alluvial recharge is then the difference between the two values, which is 221 gpm; however, the increase in spring discharge between high and low flows has been reported to be approximately 320 gpm, thirty-one percent higher than the total alluvial flow increase originating from the main canyon area. This may indicate that the remaining portion of NEWUA spring flows come from either other "non alluvial" sources or additional alluvial flow from the south tributary.

Overall Impact Potential. PacifiCorp conducted a pump test project in Rilda Canyon to determine the groundwater characteristics and source. As documented by the pump test, the major source of groundwater to the Rilda Canyon Springs is from the alluvial deposits (refer to Volume 9 - Hydrologic Support Information, Rilda Canyon Pump Test). The majority of the recharge to the alluvial deposits is from the right fork of Rilda Canyon. Recharge to the alluvial deposits of Rilda Canyon occurs above the Castlegate Sandstone to the west of the permit boundary (refer to Volume 9 Map HM-9~~: included with this submittal~~). Little impact to spring flow may actually occur unless geologic conditions change as a result of mining. Subsidence could potentially result in the development of cracking or fracturing of the subsurface geologic stratum above the mine workings. Local recharge crossing these hypothetically subsided areas could be lost from the spring recharge system, thereby directly affecting local spring flows. Mining below the right fork of the Rilda Canyon drainage will consist of first mining only (main entry development) which will minimize the potential impacts related to subsidence (refer to Volume 9 Map HM-10 ~~included with this submittal~~ and the approved Deer Creek R_2 P_2[Refer to Volume 5, Maps 3-6 and 3-7]). Mitigation for the loss of spring flow has been based on the elimination of the alluvial recharge which is unlikely to occur based upon the projected extent of the mine compared to the recharge area. Mitigation efforts based on the worst case scenario have been outlined in the following section.

Mitigation

Through intensive negotiations and investigations of possible alternatives, PacifiCorp and NEWUA agreed upon mitigation plan on August 12, 1993. The plan included construction of a slow sand water treatment plant with a 0.5 million gallon storage reservoir (the mitigation alternative information is found in Appendix G of Volume 9 - Hydrologic Section). Construction of the plant and reservoir begin in March of 1994 and was completed in November 1994. The plant was brought on-line in November 1994 utilizing Rilda Springs as one of the sources of water. PacifiCorp will continue monitoring springs in Rilda Canyon for potential mining related impacts (refer to Volume 9 - Hydrologic Section: Appendix A).

C. INTERCEPTION OF GROUNDWATER BY MINE WORKINGS

As previously discussed in this section, the Blackhawk Formation consists of interbedded layers of sandstone and mudstone separated by various minable and non-minable coal seams. The sandstone beds-fluvial channel systems are generally massive while the mudstone layers are fine textured and have a tendency to swell when wet and decompose into an impervious clay. Because of the aquiclude formed by mudstone layers in the North Horn Formation and topography, recharge to the Blackhawk Formation is limited, even along major fault systems. Due to the lithologic characteristics of the Blackhawk, both vertical and horizontal migration is constricted.

The interception of groundwater varies and is dependent on several factors. One of the most significant is that when the mine enters previously umined country, a significant amount of water is liberated. In virtually all cases the amount of water which flows into the mine exceeds the recharge and, in time, the water inflow decreases in volume. If new areas are not mined, the discharge from the mine will decrease accordingly. As reported in the annual Hydrologic Monitoring reports, flow rates for individual areas including fault zones normally decrease to less than ten percent of the initial flow rate.

Long-term monitoring of water producing zones in both Deer Creek and Wilberg/Cottonwood mines has established that once base flow has been reached, the flow is consistent over time. Monitoring has not indicated any seasonal or yearly variations (refer to the Annual Hydrologic Monitoring reports for in-mine long-term flow information).

As pointed out by Theis (1957, p. 3), water discharged from a well or, in this case, underground mines, must be balanced by 1) an increase in recharge to the groundwater system, 2) a decrease in natural discharge from the system, or 3) a decrease of groundwater in storage, or by a combination of all of these. As hydrologic studies have shown and monitoring of intercepted groundwater has verified, recharge into the underground workings is limited even in areas of faults and fractures. Based on the hydrologic characteristics of the Blackhawk and the underlying Star Point Sandstone (low porosity and hydraulic conductivities) and data from surface hydrologic monitoring, decrease in the natural discharge of the system is considered to be only a minor factor; therefore, groundwater intercepted in the permit area is concluded to be from storage. One factor which verifies this conclusion is rapid dewatering of intercepted groundwater with no apparent change in the surface hydrological system. As the USGS pointed out in Open File 81-539 and monitoring by PacifiCorp has shown, the majority of surface flow is due to the runoff from the winter snowpack and not from groundwater recharge.

D. MINING BELOW the RIGHT FORK of RILDA CANYON

A portion of the Right Fork area of Rilda Canyon lies within the proposed North Rilda Canyon Permit Application area of the Deer Creek Mine. Due to the environmental sensitivity of the Right Fork area (specifically the sub-surface hydrologic alluvial system and associated surface riparian vegetation zone), a complete analysis of a proposed "no-subsidence / long term stability" design of the 5th North Mains development within the area of the right fork of North Rilda Canyon has been conducted addressing the long term ground stability and subsidence protection of the area with regards to proposed mining. All pre-mining and post-mining conditions have been evaluated based on the best geologic and engineering information currently available (refer to R645-301-500 Engineering Section: Appendix 1).

The 4th North Mains, as projected, consists of a 5-entry development section, bearing northwest from the Deer Creek 10th West Mains. Initial location of the 10th West/4th North intersection was based on the following:

(1) Existing Blind Canyon Seam conditions encountered with regard to 10th West Mains development.
(2) Proximity to the projection of the Mill Fork Fault Graben.
(3) Most practical access route to the North Rilda - Blind Canyon and Hiawatha coal reserves, across the North Rilda Canyon Forks area.

A complete analysis of the to location and long term ground stability of the 4th North / 10th West Mains and the Left Fork of Rilda Canyon was prepared and submitted by PacifiCorp to the BLM on November 15, 1996. Approval to proceed with relocation and development of the 4th North Mains was given by the BLM (per letter) February 13, 1997.

With regard to PacifiCorp's North Rilda Area Permit Application, the 4th North Mains were originally projected to be developed northwest (approximately 3000 feet), from the 4th North / 10th West Mains intersection. The mainline development, designated as 5th North, then changed course to a northeast bearing, with development proceeding under the Right Fork area of Rilda Canyon. Selection of the Right Fork stream crossing area was based on the results of an extensive surface exploration program conducted in the Right Fork of Rilda Canyon (refer to Volume 9 maps HM-9, HM-10). A series of six drill holes were completed in 1997 to document coal seam characteristics, structural geology and hydrologic conditions. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted to minor quantities from the alluvium/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location

of the 4/5th North intersection to maximize the overburden in the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. A fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 map HM-9). The Mill Fork Canyon Graben was intersected and crossed north of the North Rilda Area permit extension in the Beaver Creek No. 4 Mine and consisted of a series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon. If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control groundwater if present.

During the development of the 5th North Mains, PacifiCorp will monitor intercepted groundwater from all sources including roof drippers and groundwater inflow from floor of the mine as specified in R645-301-200: Groundwater Monitoring. Surface water/groundwater interrelationships will monitored above and below the proposed mine crossing as specified in R645-301-200: Surface Water Monitoring. Mainline development below the Right Fork of Rilda Canyon did not intercept any groundwater, and has remained "dry" since initial development.

E. MILL FORK STATE LEASE ML-48258 ACCESS (HIAWATHA SEAM)

Mill Fork State Lease ML-48258 Access: Based on data acquired through surface coal exploration programs, Energy West developed a mine plan to access the Mill Fork State Lease with a set of 5-entry mains driven on a northwest bearing from the 6th North Mains. Mining within the Mill Fork Access corridor will be restricted to mainline development. To ensure long term stability, pillars will not be removed.

As stated earlier, in Structural Hydrologic Features, a fault system referred to as the Mill Fork Canyon Graben is projected to intersect the western portion of Federal Coal Lease U-06039 (refer to Volume 9 map HM-9). The Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area permit extension in the Beaver Creek No. 4 Mine and consisted of series of faults with a total displacement of approximately thirty (30) feet. PacifiCorp has conducted extensive exploration programs to delineate the Mill Fork Graben including a series of close spaced drill holes in the Right Fork of Rilda Canyon. Drilling was conducted on approximately 250 foot centers across the projected Mill Fork Graben from previously completed drill holes EM-158 and EM-56. No structural discontinuities were identified during drilling. Groundwater encountered during drilling was restricted

to minor quantities from the alluvial/colluvial fill (estimated at 2 - 5 GPM) near the alluvial/bedrock interface. Based on the results of the 1997 surface exploration conducted in the Right Fork of Rilda Canyon, a meeting was held in October 1997 with DOGM, USFS, and BLM to discuss the re-location of the 4/5th North intersection to maximize the overburden at the Right Fork stream crossing. The 5th North Mains were re-located approximately 800 feet west of the original projection, increasing the overburden from 120 to approximately 200 feet. In reviewing the exploration data and in-mine information from the development of the 5th North Mains, it appears that the eastern fault of the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon (refer to Volume 9 map HM-9).

Hydrologic studies conducted in association with the coal leasing to the north and northwest of the North Rilda Area identified the Mill Fork Graben as a potential source of recharge for the Little Bear Spring. PacifiCorp participated in these studies and provided funding for the second phase.

Little Bear Spring is a large spring (average flow of approximately 300 gpm) which issues from the lowest member of the Star Point Sandstone (Panther Member) located approximately two miles to the northeast of the North Rilda Area in Section 9, Township 16 South, Range 7 East. The spring was developed in 1960 by Huntington City and is currently maintained by Castle Valley Special Service District (CVSSD). Little Bear Spring provides sixty five (65) percent of the culinary water for the cities of Huntington, Cleveland and Elmo.

As stated in the Mill Fork Environmental Assessment (EA) competed in 1997, Little Bear Spring flows continuously, with average monthly discharge ranging from two hundred (200) to four hundred forty (440) gpm (CVSSD, 1997). Flow varies seasonally, with a typical increase of twenty (20) to forty (40) percent in response to spring runoff. The lowest average monthly baseflow recently measured was one hundred ninety eight (198) gpm in April 1995. Isotopic analyses performed to evaluate the age of water indicated that the spring discharges modern water, and is similar in composition to water in both Crandall and Huntington Creeks (Mayo and Associates, 1997). Further chemical analyses show that water from Little Bear Spring is very similar to surface water in both Little Bear and Huntington Creeks. Water quality in the spring is good, requiring only chlorine treatment before it is suitable for consumptive use.

Based on previous reports and field observations, the spring emanates from western fault of the Mill Fork graben. The graben is approximately one thousand (1,000) feet wide and trends from the southwest to the northeast at approximately north thirty (30) degrees east. Much of the geologic and hydrologic detail concerning the fault system was derived from the mining history of the Beaver Creek #4 Mine located in Mill Fork Canyon. Mining in the #4 Mine encountered the eastern fault (down thrown approximately thirty (30) feet on the west) of a small graben as entries were driven northwest from the portals in Mill Fork Canyon. Rock slopes were developed through the fault system down to the

coal seam level. Mining proceeded across the graben to the western up thrown fault (up thrown approximately twenty nine (29) feet on the west). A second set of rock slopes were developed to access coal reserves to the west of the graben. Coal reserves diminished rapidly to the west and the mine was eventually closed and reclaimed. Mining across and within the graben encountered only minor quantities of groundwater and flow of Little Bear Spring was not impacted.

The potential source of recharge for the graben system identified in these studies was Mill Fork Canyon. Water flowing down Mill Fork Canyon enters the alluvial system above/near the southern trace of the graben and provides recharge to the fault systems associated with Little Bear Spring.

Physically, the North Rilda Area (including the Mill Fork State Coal Lease Access) is separated from Little Bear Spring by Mill Fork Canyon. As indicated above, the Mill Fork Canyon Graben was intersected and crossed to the north of the North Rilda Area in the Beaver Creek # 4 Mine. The mine was a relatively dry mine with only few isolated roof drippers associated with the Mill Fork Fault system and Little Bear Spring was not impacted due to mining.

The potential for mining activities in the North Rilda Area (including the Mill Fork State Coal Lease ML-48258 Access) to impact Little Bear Spring is believed to be minimal for several reasons;

1) Little Bear Spring is located two miles north of the North Rilda Area,
2) there is a physical barrier between the North Rilda Area and Little Bear Spring - Mill Fork Canyon,
3) exploration data and in-mine information from the development of the 5th North Mains, indicates that the displacement associated with the Mill Fork Graben diminishes to the south from where it was intercepted in the Beaver Creek No. 4 Mine located north of Mill Fork Canyon,
4) mining within the Mill Fork State Coal Lease access will be restricted to development mining only (no subsidence is projected),
5) mining in the Mill Fork State Coal Lease access will be within the Hiawatha coal seam which is located approximately two hundred feet stratigraphically above the source of the Little Bear Spring,
6) mining north the North Rilda Area (Beaver Creek #4 Mine) which intercepted and penetrated the Mill Fork Graben (identified as a potential source of groundwater recharge) did not impact the flow of Little Bear Spring.

Little Bear Spring Mitigation: If mining intersects faulting related to the Mill Fork Graben during development, permanent seals will be installed to control unusual or atypical groundwater if present. PacifiCorp will utilize a pressure grout system to limit groundwater infiltration. In addition, PacifiCorp will monitor groundwater as detailed in the following section; R645-301-731.200: Water Monitoring: Groundwater B: In-Mine.

Depletion of Storage

Three main areas-types of groundwater depletion have been documented to occur within the East Mountain permit area. They include: 1) fluvial sandstone channel systems, 2) faults and fractures, and 3) structural low areas. Each area-type will be discussed separately as it pertains to the North Rilda area.

1. *Fluvial Sandstone Channel Systems*

The majority of the intercepted groundwater was confined to dewatering or perched fluvial sandstone systems. The sandstone channels (ancient river systems) overlie and scour into the underlying strata (refer to Volume 9 - Hydrologic Section: Maps HM-2 and HM-3). The locations of the channels shown on HM-2 and HM-3 are based on data collected from in-mine mapping and numerous drill holes, both in-mine and surface, that have been completed on the property. These channel systems were part of a deltaic depositional setting active during and after the coal-forming peat accumulation. The largest influx of water originates from the roof when mining advances beneath sandstone top. The sandstone, which is semi-permeable and porous, affords an effective route of water transport. Mudstone, siltstone, and interbedded materials generally act as aquicludes which impede water flow unless fracturing of the formation has allowed for secondary permeability. Of the water producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances, the area adjacent to the active face continues to be excessively wet and previously mined wet areas experience a decrease in flow. Data collected from 1978 through 1996 indicate a ninety percent reduction in water flows from roof sampling sites over a five-month period (or less) as the mining face is advanced (review annual Hydrologic Monitoring reports). It has also been noted that the outermost entries of a multiple entry system remain wet for a longer period of time than the inner entries. It appears that the water source is being dewatered since excavated areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, i.e., a perched aquifer, or have a limited recharge capacity, i.e., poor horizontal and vertical permeability. Figure HF-42 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) depicts an idealized view of the dewatering process.

To monitor and to quantify the effects of dewatering the perched aquifers overlying the coal seams and on the Star Point Sandstone, PacifiCorp installed a series of holes both in the Deer Creek and Cottonwood/Wilberg mines. These holes are located in main development entries and are shown on maps HM-2 and HM-3 (hole development information can be found in Volume 9 - Hydrologic Support Information). Holes in the Cottonwood/Wilberg Mine were developed in the upper member of the Star Point Sandstone - Spring Canyon. Pressure transducers were installed and monitored on a continuous basis to quantify the impacts to the

Star Point Sandstone due to dewatering of the isolated perched aquifers above the Hiawatha Seam. As shown in Figure HF-44 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP) the water elevations remained constant over time with no apparent evidence of an impact-cone of depression due to dewatering of the perched aquifers. In the Deer Creek Mine a series of holes was developed in the lower portion of the Blackhawk and upper member of the Star Point Sandstone. These holes are located along the axis of the Straight Canyon Syncline and are in close proximity to the Roans Canyon Fault system (see HM-2). Monitoring of these wells has shown a decline of between two to seven feet in elevation thought to be related to interception of groundwater in the development entries off 4th South, Deer Creek Mine. Mining in the 4th South area was completed in May of 1992 and seals were installed in 4th South between crosscuts 24 and 25 (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP: Figure HF-45). Monitoring of a well adjacent to the sealed area (3rd North xc-8) revealed the level of the water returned pre-mining level within approximately two years of the seal installation (refer to the 1995 Hydrologic Monitoring Report). To develop an possible area of influence-cone of depression on a regional basis, PacifiCorp installed a series of groundwater monitoring wells in Cottonwood Canyon downgradient of future mining north of the Roans Canyon Fault system (refer to Volume 9 - Hydrologic Section of the Deer Creek MRP: Appendix F).

Lithologic and hydrologic characteristics of the North Rilda area were evaluated through a series of exploration programs conducted from 1979 through 1996. A total of sixteen (16) surface exploration holes were completed utilizing both conventional drilling techniques and helicopter supported operations. Even though sandstone deposits exist overlying the coal seams no measurable water quantities were detected during the drilling operations.

2. *Faults and Fractures*

Another source of intercepted groundwater is faults and fractures, especially in the Deer Creek Mine. As discussed in the regional and permit area geology (see R645-301-721) the strata within the property have been offset by a series of north-south trending fault zones. Generally, the faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in both the Deer Creek and Wilberg mines.

The Pleasant Valley Fault consists of two parallel fractures about 150 feet apart. The faults' total displacement (where it was intersected in the Deer Creek Mine) to the north is 150 feet with its down thrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine near the south end of the property. Where the fault has been intersected by mine workings, groundwater inflow has been insignificant.

Another north-south trending fault, the Deer Creek Fault, is present to the east of the Pleasant Valley Fault. It limits the eastward development of the Wilberg/Cottonwood and Deer Creek mines and also forms an aquiclude preventing water migration to the east. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being down thrown.

A northeast-southwest trending fault system, the Roans Canyon Graben, is present along the axis of the Straight Canyon Syncline. The system contains up to six normal faults having displacements ranging from a few feet to over 150 feet. Coal deposits present to the north of the fault have been accessed through rock tunnels driven from the 3rd North section of the Deer Creek Mine.

Based upon the extensive surface exploration programs and surface mapping, no faulting is projected within the proposed mine plan (refer to Volume 9 Map HM-9 ~~enclosed within this document~~). The projection of the Mill Fork Canyon fault system is to the west of the proposed mine plan area (refer to Volume 9 Map HM-9 ~~enclosed within this document~~).

3. *Structural Low Areas*

Structural features such as the Roans Canyon Fault Graben, the Straight Canyon Syncline, and the Deer Creek Fault, had a influence on the hydrologic regime south of North Rilda within the East Mountain permit area (detailed in Volume 9 - Hydrologic Section). Geology of the North Rilda Area is less complex than that of central portion of the East Mountain property (see Volume 8 - Geology Section). The fault system that crosses Mill Fork canyon (referred to as the Mill Fork Canyon fault system) trends to the west of the projected mine workings. The Mill Fork Canyon fault system was intersected and crossed to the north of the North Rilda permit extension in the Beaver Creek Coal Company No. 4 Mine. The graben consisted of series of faults with a total displacement of approximately thirty (30) feet. Beaver Creek No. 4 Mine was a relatively dry mine with only few isolated roof dippers associated with the Mill Fork Fault system.

Quality

The mines in the coal fields of the Wasatch Plateau tend to act as interceptor drains. The groundwater that is brought to the surface has a lower dissolved solids content than would have existed were the water to continue its downward movement through shale layers, dissolving increased amounts of salt with distance (Southeastern Utah Association of Governments, 1977; Vaughn Hansen Associates, 1979; Danielson et al., 1981). The quality also decreases vertically because of the influence of marine sediments as well as along the trend of decreasing quality from north to south.

Post Mining

The monitoring of in-mine water sources has shown that the long-term water flow from a given area is much less than ten percent (10%) of the initial flow from the area. Most of the current inflow into the mine workings is from areas where water storage has not been depleted. After the storage has been depleted, the flow will reduce to roughly equal the recharge rate which is expected to be less than ten percent (10%) (data presented earlier in this report) of the current discharge rate.

Post mining discharge from the North Rilda Area is not anticipated due to the limited extent of the groundwater resources. As discussed in section 721: GENERAL REQUIREMENTS - EXISTING GROUNDWATER RESOURCES: REGIONAL AND PERMIT AREA GROUNDWATER CHARACTERISTICS groundwater resources in the the North Rilda Area is limited due to several factors including; stratigraphic controls, limited surface area for infiltration, topographic configuration of the area (incised canyons), and outcropping of the Star Point Sandstone Formation around the entire North Rilda Ridge. If intercepted perched aquifers are encountered in the North Rilda Area, water will migrate downdip to the south/southeast, (refer to Volume 8 - Geologic Section of the Deer Creek MRP for structual contour maps of the Blind Canyon and Hiawatha seams). If the impounded water exceeds the capacity of the abandoned workings, water from the North Rilda Area will migrate to the northern portion of 3rd North and eventually flow to the south/southwest.

R645-301-729 CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA)

The Division will provide an assessment of the probable cumulative hydrologic impacts of the proposed coal mining and reclamation operation and all anticipated coal mining and reclamation operations upon surface and groundwater systems in the cumulative impact area.

R645-301-730 OPERATION PLAN

Water Monitoring Location Map: refer to Volume 9 - Hydrologic Section: Map HM-1.

R645-301-731 GENERAL REQUIREMENTS

PacifiCorp has submitted a plan to minimize disturbance to the hydrologic balance, to prevent material damage, and to support approved post-mining land use (see Operational and Reclamation plans of the individual PAP's). Volume 11 North Rilda Area details the plan to minmize disturbance to the hydrologic balance related to the North Rilda Canyon Portal Facilities, to prevent material damage, and to support approved post-mining land use.

R645-731-100 HYDROLOGIC BALANCE PROTECTION

R645-731.110-112 Groundwater Protection

Although the analysis of the overburden samples tested has shown that no toxic or hazardous materials are present, groundwater quality will be protected by handling earth materials and runoff in a manner that minimizes infiltration to the groundwater system.

R645-731-120-122 Surface Water Protection

Surface water quality will be protected by handling earth materials, groundwater discharges, and runoff in a manner that minimizes the potential for pollution. Energy West Mining Company will develop a Drainage and Sediment Control Plan to protect the surface and groundwater resources in the area of the North Rilda Canyon Portal Facilities which includes; the fan portal access, mine facilities, topsoil storage area. The Drainage and Sediment Plan will ensure protection of water resources by handling soil, overbuden and refuse from historical mining in such a manner to minimize discharge of pollutants to the hydrologic regime. Details of the Drainage and Sediment Control Plan will be presented in R645-301-700 Appendix 2.

R645-301-731.200 WATER MONITORING

Groundwater

Groundwater within the East Mountain permit area (including North Rilda area) will be monitored according to the schedules in Appendix A (refer to Volume 9 - Hydrologic Section). Monitoring equipment, structures used in conjuction with monitoring the quality and quantity of groundwater on-site and off-site will be properly installed, maintained, operated, and will be removed by PacifiCorp when approved by the Division.

Groundwater will be monitored and data will be submitted on a electronic format to the Division's Coal Water-Quality Database quarterly,~~.at least every three months~~ for each monitoring location. Monitoring subimittals will include analytical results from each sample taken during the quarter. When the analysis of any groundwater sample indicates noncompliance with the permit conditions, PacifiCorp will promptly notify the Division and immediately take actions provided for in R645-300-145 and R645-301-731.

PacifiCorp has conducted baseline and operational monitoring of the groundwater resources in and adjacent to the North Rilda permit area. The data collected have provided information useful in the understanding of potential hydrologic consequence of mining. Monitoring of the following groundwater

resources will proceed through mining and continue during reclamation until bond release. Removal of the groundwater monitoring structures, *(Rilda Canyon piezometers)*, will be approved by the Division in conjuntion with the Utah State Division of Water Rights.

A. *East Mountain Springs*: No springs will be undermined in the North Rilda area. Only two springs are within the North Rilda permit area, 80-50 located in Section 29 and the Rilda Canyon Springs located in Section 28 (refer to Volume 9 Map HM-9 ~~included with this document~~). Spring 80-50 will be monitored during the months of July and October (included in the East Mountain Spring Monitoring Program, refer to Volume 9 - Hydrologic Section: Appendix A). Rilda Canyon Springs will be monitored in cooperation with NEWUA on a monthly basis for flow and quarterly for quality. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

B. *In-Mine*: Intercepted groundwater sampling sites, (either roof drippers or contribution from the floor), will be established according to the Special Condition Stipulation in the Deer Creek permit renewal, (February 6, 1996), "*If during entry development, sustained quantities of groundwater are encountered which are greater than 5 gpm from a single source in an individual entry, and which continue after operational activities progress beyond the area of groundwater production, PacifiCorp must monitor these flows for quality and quantity under the approved monitoring plan".* In addition to the standard plan described above, if mining encounters significant quantities of groundwater which issues from a fault zone, PacifiCorp will; quantify the volume, sample for water quality according to the approved monitoring plan (baseline parameters for two year period), conduct isotopic sampling using a systematic approach (phase 1: tritium analysis, phase 2: depending the results of the tritium sampling, perform carbon age dating). Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

C. *Waste Rock Wells:* One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

D. *Rilda Canyon Springs - NEWUA:* One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the "DOGM Guidelines for Groundwater Water Quality" (refer to Volume 9 - Hydrologic Section: Appendix A).

E. *Rilda Canyon Wells - NEWUA Spring Area:* Water level will monitored on a monthly basis depending upon access (refer to Volume 9 - Hydrologic Section: Appendix A).

Surface Water

PacifiCorp has conducted baseline monitoring of surface waters within and adjacent to the permit area (refer to Annual Hydrologic Monitoring Reports). Long-term monitoring sites in Rilda Canyon have been equipped with Parshall style flumes to facilitate monitoring. Monitoring equipment, structures used in conjuction with monitoring the quality and quantity of surface water on-site and off-site will be properly installed, maintained, operated, and will be removed by the PacifiCorp when approved by the Division. Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the "DOGM Guidelines for Surface Water Quality." Locations of all surface monitoring sites and sampling schedules can be found in Appendix A (refer to Volume 9 - Hydrologic Section).

Surface water will be monitored and data will be submitted in an electronic format to the Division's Coal Water-Quality Database quarterly,~~at least every three months~~ for each monitoring location. Monitoring submittals will include analytical results from each sample taken during the quarter. When the analysis of any surface water sample indicates noncompliance with the permit conditions, PacifiCorp will promptly notify the Division and immediately take actions provided for in R645-300-145 and R645-301-731. For point source discharges, monitoring will be conducted in accordance with 40 CRF Parts 122 and 123, R645-301-751 and as reqiured by the Utah Division of Environmental Health for National Pollutant Discharge Elimination System permit.

R645-301-731.300 ACID AND TOXIC-FORMING MATERIALS

To characterize the acid-forming potential of the strata encountered during mining, Energy West collected samples of the immediate roof, mid-seam, and floor. All samples were analyzed by a certified laboratory according to the "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. Data collected and reported in R645-301-600 Geologic Section and Volume 11 Mill Fork Lease Geologic Section reveals overburden encountered in the mine is non-acid/non-toxic forming, refer to R645-301-600 Geologic Section. As discussed in the R645-301-500 Engineering Section, all coal produced from the North Rilda/Mill Fork Lease will be transported to the facilities in Deer Creek Canyon. Under normal operations, waste rock encountered in the mine will be left in-place or transported to the Deer Creek Waste Rock Storage Site, refer to Volume 10. In addition, a temporary containment area will be designated at the North Rilda Canyon Portal Facilities for incidental quantities of waste rock which will be transported to the Deer Creek Waste Storage Site for final placement.~~Refer to Waste Rock Permit applications.~~

R645-301-731.400 TRANSFER OF WELLS

Before final release of bond, exploratory 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. With the prior approval of the Division, wells may be transferred to another party for further use. However, at a minimum, the conditions of such transfer will comply with Utah and local laws and the permittee will remain responsible for the proper management of the well until bond release in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

R645-301-731.500 DISCHARGES

R645-301-731.511 DISCHARGES INTO AN UNDERGROUND MINE

Discharges into an underground mine are prohibited, unless specifically approved by the Division after a demonstration that the discharge will:

731.511.1 Minimize disturbance to the hydrologic balance on the permit area, prevent material damage outside the permit area and otherwise eliminate public hazards resulting from coal mining and reclamation operations;

731.511.2 Not result in a violation of applicable water quality standards or effluent limitations;

731.511.3 Be at a known rate and quality which will meet the effluent limitations of R645-301-751 for pH and total suspended solids, except that the pH and total suspended solids limitations may be exceeded, if approved by the Division; and

731.511.4 Meet with the approval of MSHA.

731.512 Discharges will be limited to the following:

731.512.1 Water;

731.512.2 Coal processing waste;

731.512.3 Fly ash from a coal fired facility;

731.512.4 Sludge from an acid-mine-drainage treatment facility;

731.512.5 Flue-gas desulfurization sludge;

731.512.6 Inert materials used for stabilizing underground mines; and

731.512.7 Underground mine development wastes.

To minimize disturbance to the hydrologic balance of the Rilda Canyon drainage system, Energy West proposes to construct the North Rilda Canyon Portal Facilities with separate collection systems isolating domestic waste water from washdown/gray water. Domestic waste water will pass through septic system and be transported to approved facility. Washdown/gray water will be transported to a abandoned area of the mine.

Refer to Mine Dewatering R645-301-721 and UPDES information in Appendix B in Volume 9 - Hydrologic Section of the Deer Creek Mine MRP.

R645-301-731.520 GRAVITY DISCHARGES FROM UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES.

R645-301-731.521 SURFACE ENTRIES AND ACCESSES TO UNDERGROUND WORKINGS

During the development of the North Rilda Canyon Portal Facilities two separate surface breakouts will be constructed; 1) Mine Fan, and 2) Intake Rock Slope (refer to R645-301-500 Engineering Section). Mine Fan portal will be developed in the Hiawatha seam, located above the mine facilities. Due to the elevation relief from the coal outcrop to the valley floor, Energy West will develope a rock slope through the upper member of the Star Point Sandstone from the portal facility area to an interception point in 1st Right. Post mine gravity discharge is not anticipated as a result of the construction of the Rilda Canyon Portal Facilities. Inclination (dip) of the Hiawatha seam will prevent water from discharging at the portal facilities. If groundwater is intercepted during the development of the intake rock slope, prior to final reclamation, seals will be installed to prevent post mine gravity discharge.

R645-301-731.530 STATE-APPROPRIATED WATER SUPPLY

Energy West Mining Company will promptly replace any State-appropriated water supply that is contaminated, diminished or interrupted by UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992, if the affected water supply was in existence before the date the Division received the permit application for the activities causing the loss, contamination

or interruption. The baseline hydrologic and geologic information required in R645-301-700 will be used to determine the impact of mining activities upon the water supply.

R645-301-731.600 STREAM BUFFER ZONES

Mining related activities will not occur within 100 feet of a perennial or intermittent stream unless the Division authorizes such activities.

As mentioned in the PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION section, (728: Hydrologic Balance - Surface Water System), the drainages conveying runoff away from the permit areas are streams in Rilda, and Mill Fork canyons. Second mining, ie. longwall extraction, room & pillar, of the North Rilda area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur beneath the stream channels of these canyons. First mining, ie. mainline, gateroad development, will occur below the right fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4/5th North Mains development within the Right Fork of Rilda and the long-term stability analysis, refer to the Engineering Section R645-301-500 Appendix 1. To protect the alluvial/colluvial system of the Right Fork of Right Fork of Rilda Canyon, a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the Hiawatha Seam, the lowest seam to be mined. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill with the canyon's side slopes. The angle of draw was calculated from the Hiawatha Seam horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted from full extraction mining. The referenced 15 degree angle of draw is an industry/agency accepted standard used for delineation of surface influence protection from mining areas considered for full extraction mining. Mining experience at Energy West's Deer Creek, Cottonwood, and Trail Mountain mines has provided a sound, scientific basis for using the 15° angle of draw mentioned above (refer to Annual Subsidence Reports of the Deer Creek MPR).

The proposed disturbance associated with the North Rilda Canyon Portal Facilities will be drained by ephemeral drainages on the south facing slope of North Rilda ridge which are tributaries to Rilda Creek. The undisturbed drainages will report to Rilda Creek above and below the main undisturbed bypass culvert. Stream buffer zones will be maintained above and below the main bypass culvert. Portions of the facilities will be within one hundred (100) feet of Rilda Creek. Buffer signs will be installed along Rilda Creek to indicate the area which beyond no disturbance shall take place.

Water quality of Rilda Creek will be protected from potential impacts associated with the North Rilda Canyon Portal Facilities through a combination sediment control structures and revegetation (refer

to R645-301-300 Biology Section for interim revegetation and R645-301-700 Appendix 2 for Drainage and Sediment Control Plan).

R645-301-731.700 CROSS SECTION AND MAPS

R645-301-710 thru R645-301-720 and R645-301-750

A water supply intake system known as "North Emery Water Users Association - Rilda Canyon Springs" is located in Section 28, Township 16 South, Range 7 East (refer to Volume 9 Map HM-9 ~~within this volume~~, a detailed drawing of the collection system is provided in Volume 9 - Hydrologic Section of the Deer Creek Mine MRP). The intake system consists of a series of french drains collecting near surface alluvial water as a supply source for culinary water (for complete description of the NWEUA system refer to R645-721 "Existing Groundwater Resources"). ~~No surface disturbance is planned within the boundaries of the North Rilda Area. Accordingly, it will not be necessary to divert, collect, convey, store, or discharge water from disturbed areas.~~

R645-301-731.800 WATER RIGHTS AND REPLACEMENT

In order to fulfill the requirements to restore the land affected by applicant's mining operations to a condition capable of supporting the current and post-mining land uses stated herein, the applicant will replace water determined to have been lost or adversely affected as a result of applicant's mining operations if such loss or adverse impact occurs prior to final bond release. The water will be replaced from an alternate source in sufficient quantity and quality to maintain the current and post-mining land uses.

As outlined in the Existing Groundwater and Surface Resources and Probable Consequences Determination, second/full extraction mining of the North Rilda Area will be limited to the ridge separating Rilda and Mill Fork canyons and subsidence will not occur below the stream channels of these canyons. No springs will be undermined in the North Rilda Area. First mining, ie. mainline, gateroad development, will occur below the right fork of Rilda Canyon. For a complete analysis of the proposed "no subsidence" design of the 4/5th North Mains development within the Right Fork of Rilda and the long-term stability analysis refer to the Engineering Section R645-301-500 Appendix 1. To protect the alluvial/colluvial system of the right fork of Rilda Canyon a stream buffer zone was established based on the extent of the riparian zone and the angle of draw from the lowest seam to be mined - Hiawatha Seam. The riparian zone within the right fork of Rilda Canyon was delineated by field observation, aerial photography, and map contour analysis. The extent of the identified zone is based on the contact of the alluvial/colluvial fill and the canyon's side slopes. The angle of draw was calculated from the lowest seam to be mined, Hiawatha, horizon/elevation @ 15 degrees to the point of intersection on the surface. The stream buffer zone delineates the area restricted to full

extraction mining. If necessary to prevent groundwater infiltration below the right fork of Rilda Canyon, PacifiCorp will utilize a pressure grout system similar to the technic applied at the Roans Canyon Fault to limit groundwater infiltration.

R645-301-732 SEDIMENT CONTROL MEASURES

732.100 Siltation Structures. Siltation structures will be constructed and maintained to comply with R645-301-742.214 (refer to R645-301-740). Any siltation structure that impounds water will be constructed and maintained to comply with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

R645-301-732.200 SEDIMENTATION PONDS

732.200-210 Sedimentation ponds whether temporary or permanent, will be designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763. No permanent structures including sediment ponds are planned for the Rilda Canyon Portal Facilities. A Temporary sediment pond will be constructed below the proposed surface facilities designed with a combination of a principal and emergency spillways that will safely discharge a 25-year, 6 hour precipitation event (refer to R645-301-742.220).

732.300 Diversions. All diversions will be constructed and maintained to comply with the requirements of R645-301-742.100 and R645-301-742.300.

732.400 Road Drainage. All roads will be constructed, maintained and reconstructed to comply with R645-301-742.400.

R645-301-733-733.240 IMPOUNDMENTS

No permanent structures including impoundments are planned for the North Rilda Canyon Portal Facilities. A Temporary impoundment (sediment pond and containment berms) will be designed and constructed as specified by the R645-301-733 and R645-301-743 (refer to R645-301-743 for design specifications).

R645-301-734 DISCHARGE STRUCTURES

Discharge structures will be constructed and maintained to comply with R645-301-744.

R645-301-735 DISPOSAL OF EXCESS SPOIL

Excess spoil material will be generated during the construction of the 2100 foot slope to access the Hiawatha coal seam above the mine facilities pad. Excess spoil will be utilized as a fill material for the construction of the mine facilities pads. The spoil will be placed in a controlled manner to ensure mass stability and prevent mass movement during and after construction. Excess spoil will meet the design criteria of R645-301-535. See this section for detailed design.

R645-301-736 COAL MINE WASTE

An area designated for the disposal of coal mine waste and coal mine waste structures will be constructed and maintained to comply with R645-301-746 (refer to Volume 11 Map 5-2 for the location of coal mine waste temporary storage area).

R645-301-737 NONCOAL MINE WASTE

Noncoal mine waste will be stored and final disposal of noncoal mine waste will comply with R645-301-747.

R645-301-738 TEMPORARY CASING AND SEALING OF WELLS

Each well which has been identified in the approved permit application to be used to monitor ground water conditions will comply with R645-301-748.

R645-301-740 DESIGN CRITERIA AND PLANS

R645-301-741 GENERAL REQUIREMENTS

Energy West Mining Company will design, construct and maintain sediment control measures using the best technology currently available to:

a. Prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area;
b. Meet the effluent limitations under R645-301-751; and
c. Minimize erosion to the extent possible.

Sediment control measures include practices carried out within and adjacent to the disturbed area. The sedimentation storage capacity of practices in and downstream from the disturbed areas will reflect the degree to which successful mining and reclamation techniques are applied to reduce erosion and control sediment. Sediment control measures consist of the utilization of proper mining and reclamation methods and sediment control practices, singly or in combination. Sediment control methods include, but are not limited to:

a. Retaining sediment within disturbed areas;
b. Diverting runoff away from disturbed areas;
c. Diverting runoff using protected channels or pipes through disturbed areas so as not to cause additional erosion;
d. Using straw dikes, riprap, check dams, mulches, vegetative sediment filters, dugout ponds and other measures that reduce overland flow velocities, reduce runoff volumes or trap sediment.
e. Paving.

R645-301-742.200 SILTATION STRUCTURES

Additional contributions of suspended solids and sediment to streamflow or runoff outside the permit area will be prevented to the extent possible using the best technology currently available.

742.212 Siltation structures for an area will be constructed before beginning any coal mining and reclamation operations in that area and, upon construction, will be certified by a qualified registered professional engineer to be constructed as designed and as approved in the reclamation plan.

742.213 Any siltation structures which impounds water will be designed, constructed and maintained in accordance with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

For complete details concerning design, construction and maintenance of sediment control measures, siltation structures, sedimentation pond, and impoundments refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan.

R645-301-742.220 SEDIMENTATION POND

742.221.1 Preliminary plans for the North Rilda Canyon Portal Facilities include construction of single sedimentation pond located at the eastern extent of the

disturbed area (refer to R645-301-500 Engineering Section Map 5-2). Analysis utilized to determine the size and hydraulics related to the construction and operation of the sedimentation pond are included R645-301-700 Appendix 2: Drainage and Sediment Control Plan.

742.221.2 The sedimentation pond for the North Rilda Canyon Portal Facilities will be as near as possible to the disturbed area and out of perennial streams unless approved by the Division; and

742.221.3 Be designed, constructed, and maintained to:

742.221.31 Provide adequate sediment storage volume;

742.221.32 Provide adequate detention time to allow the effluent from the ponds to meet Utah and federal effluent limitations;

742.221.33 Contain or treat the 10-year, 24-hour precipitation event ("design event") unless a lesser design event is approved by the Division based on terrain, climate, or other site-specific conditions and on a demonstration by the operator that the effluent limitations of R645-301-751 will be met;

742.221.34 Provide a nonclogging dewatering device adequate to maintain the detention time required under R645-301-742.221.32.

742.221.35 Minimize, to the extent possible, short circuiting;

742.221.36 Provide periodic sediment removal sufficient to maintain adequate volume for the design event;

742.221.37 Ensure against excessive settlement;

742.221.38 Be free of sod, large roots, frozen soil, and acid- or toxic forming coal-processing waste; and

742.221.39 Be compacted properly.

742.222 As discussed above, preliminary plans for the North Rilda Canyon Portal Facilities include construction of single sedimentation pond. Upon final design, the sedimentation pond will comply with R645-301-742.220 and qualifying criteria of the MSHA, 30 CFR 77.216(a).

R645-301-742.230 OTHER TREATMENT FACILITIES

Preliminary plans for the North Rilda Canyon Portal Facilities do not include construction of "other treatment facilities".

R645-301-742.240 EXEMPTIONS

It is anticipated during the design process that disturbed areas which cannot be reasonably treated by the sedimentation pond due to remote geographic locations and small areas not justifying a sediment pond but which cannot meet effluent limitations without treatment, are considered Alternative Sediment

Control Areas (ASCA). These areas will be treated by the best control technology available which includes, but is not limited to: silt fences, berms, catch basins, strawbales, gravel filter dikes, check dams, sediment traps and mulches. A list of the ASCA's within the North Rilda Canyon Portal Facility area is discussed in R645-700 Appendix 2.

R645-301-742.300 DIVERSIONS

R645-301-742.300.310-314 GENERAL REQUIREMENTS

Two separate drainage systems will be provided at the North Rilda Canyon Portal Facility site and will classified as "undisturbed" and "disturbed" collection systems. The "undisturbed" system collects water above the portal site and from side slopes adjacent to the site and will convey it past the disturbed area into the natural channel of Rilda Canyon Creek.. The "disturbed" collection system collects runoff from portal area, parking lots, storage areas and bathhouse area and will convey it to the sedimentation pond.

Undisturbed Drainage System

The undisturbed drainage control plan will consist of:

1) Undisturbed drainage above the North Rilda Canyon Portal Facility will be diverted beneath the site through a properly designed culvert and be discharged below the disturbed area.
2) Undisturbed from runoff from un-named canyons near the reclaimed Leroy and Rominger mines will be collected by inlet boxes and conveyed through a corrugated steel pipe system to the main undisturbed bypass culvert.

Disturbed Drainage System

The "disturbed" collection system collects runoff from roads, parking lots, storage areas, portal area and the bathhouse area conveying it to the sedimentation pond. This system will consist of concrete catch basins, small-diameter CMP culvert and open ditches designed to adequately collect and pass peak flow from a 10 yr./6 hr. precipitation event (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan for details related to the design and construction of the diversion structures).

Maintenance on the above drainage system consists of annual inspection and cleaning of all culverts, inlets and ditches. Trash and debris are removed and the system is checked for damage which might require repair to ensure proper operation of the system.

During mine-site reclamation, all diversions will be removed and the streambed re-established and riprapped to prevent erosion. Details are included in R645-301-540 Engineering Section.

R645-301-742.320 DIVERSION OF PERENNIAL AND INTERMITTENT STREAMS

742.321 Rilda Canyon Creek is perennial stream below Rilda Canyon Springs to the confluence of Huntington Creek. As stated in R645-301-742.300: Undisturbed drainage above the North Rilda Canyon Portal Facility will be diverted beneath the site through a properly designed culvert and be discharged below the disturbed area (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan).

742.322 The design capacity of the Rilda Creek bypass culvert will be at least equal to the capacity of the unmodified stream channel immediately upstream and downstream from the diversion.

742.323 The requirements of R645-301-742.312.2 will be met when the temporary diversion for Rilda Creek is designed so that the combination of channel, bank

and floodplain configuration is adequate to pass safely the peak runoff of a 10-year, 6-hour precipitation event.

742.324 The design and construction of all stream channel diversions of perennial and intermittent streams will be certified by a qualified registered professional engineer as meeting the performance standards of R645-301 and R645-302 and any design criteria set by the Division.

R645-301-742.330 DIVERSION OF MISCELLANEOUS FLOWS

742.331 Miscellaneous flows, which consist of all flows except for perennial and intermittent streams, may be diverted away from disturbed areas if required or approved by the Division. Miscellaneous flows will include ground-water discharges and ephemeral streams. Undisturbed runoff from un-named ephemeral drainages near the reclaimed Leroy and Rominger mines will be collected by inlet boxes and conveyed through a corrugated steel pipe system to the main undisturbed bypass culvert. Side slopes adjacent to the ephemeral drainages will be collected through a series of designed ditches, drop inlets and culverts located at the toe-of-slopes and conveyed to the main undisturbed bypass culvert (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan).

742.332 The design, location, construction, maintenance, and removal of diversions of miscellaneous flows will meet all of the performance standards set forth in R645-301-742.310. Refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan for design, location and maintenance schedule related to the diversion of miscellaneous flows. Removal and reclamation of the diversion structures is covered in R645-301-550 of this volume.

742.333 The requirements of R645-301-742.312.2 will be met when the temporary diversions for miscellaneous flows are designed so that the combination of channel, bank and floodplain configuration is adequate to pass safely the peak runoff of a 2-year, 6-hour precipitation event for a temporary diversion (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan).

R645-301-742.400 ROAD DRAINAGE

742.410-411 All roads associate with the Rilda Canyon Portal Facilities will be designed to ensure environmental protection and safety appropriate for their planned duration and use, including consideration of the type and size of equipment used, the design and construction or reconstruction of roads will incorporate appropriate limits for surface drainage control, culvert placement, culvert size, and any necessary design criteria established by the Division.

742.412 The North Rilda Canyon Portal Facilities is located adjacent to Emery Couny Road #306. No part of any road will be located in the channel of an intermittent or perennial stream unless specifically approved by the Division in accordance with applicable parts of R645-301-731 through R645-301-742.300.

742.413 Roads will be located to minimize downstream sedimentation and flooding.

742.420-422 Primary Roads.
To minimize erosion, all primary road will be to be located, insofar as practical, on the most stable available surfaces. Design of the North Rilda Canyon Portal Facilities includes one (1) primary road - Facility Access Road (refer to R645-301-534).

742.423-5 Drainage Control.

Facility Access Road will be designed, constructed or reconstructed and maintained to have adequate drainage control, using structures such as specified in R645-301-534. The drainage control system will be designed to pass the peak runoff safely from a 10-year, 6-hour precipitation event, or an alternative event of greater size as demonstrated to be needed by the Division.

R645-301-743 IMPOUNDMENTS

No permanent structures including impoundments are planned for the North Rilda Canyon Portal Facilities. A Temporary impoundment (sediment pond and containment berms) will be designed and constructed as specified by the R645-301-733, 743 and R645-301-512 (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan for design specifications).

R645-301-744 DISCHARGE STRUCTURES

744.100 Discharge from the North Rilda Canyon Portal Facility sedimentation pond, temporary impoundments, and diversions will be controlled, by energy dissipators, riprap channels and other devices, where necessary, to reduce erosion to prevent deepening or enlargement of stream channels and to minimize disturbance of the hydrologic balance (refer to R645-301-700 Appendix 2: Drainage and Sediment Control Plan).

744.200 Discharge structures will be designed according to standard engineering design procedures.

R645-301-745 DISPOSAL OF EXCESS SPOIL

No significant excess spoil is anticipated during the development of the Rilda Canyon Portal Facilities. If excess quantities are encountered, an area designated for the disposal of excess spoil and excess spoil structures will be constructed and maintained to comply with R645-301-745 or disposed of at the Deer Creek Waste Rock Facility.

R645-301-746 COAL MINE WASTE

An area designated for the disposal of coal mine waste and coal mine waste structures will be constructed and maintained to comply with R645-301-746 (refer to R645-301-500 Engineering Map 5-2 for the location coal mine waste temporary storage area). All coal mine waste generated at the Rilda Canyon Facility will be disposed of at the Deer Creek Waste Storage Facility.

R645-301-747 DISPOSAL OF NONCOAL MINE WASTE

747.100 Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other combustible materials generated during coal mining and reclamation operations will be placed and stored in a controlled manner in a designated temporary storage site and disposed of at a state-approved solid waste disposal area (refer to R645-301-500 Engineering Section Map 5-2 for the location of the non-coal waste storage site).

R645-301-750 PERFORMANCE STANDARDS

All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. For the purposes of SURFACE COAL MINING AND RECLAMATION ACTIVITIES, operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

751 Water Quality Standards and Effluent Limitations. Discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

752 Sediment Control Measures. Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-760 (refer to R645-301-700 Appendix 2: Drainage and Sediment Plan for design, construction and maintenance of sediment controls for the North Rilda Canyon Portal Facilities).

752.100 Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763.

752.200 Road Drainage. Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762 and to achieve the following:

752.210 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;

752.220 Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;

752.230 Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751;

752.240 Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and

752.250 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 to comply with R645-301-733, R645-301-734, R645-301-743, R645-301-745 and R645-301-760.

754 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste. Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with R645-301-735, R645-301-736, R645-301-745, R645-301-746, R645-301-747 and R645-301-760.

755 Casing and Sealing of Wells. All wells will be managed to comply with R645-301-748 and R645-301-765. Each water well will be cased, sealed, or otherwise managed, as approved by the Division.

R645-301-760-765 RECLAMATION

Before abandoning a permit area or seeking bond release, the Energy West Mining Company will ensure that all temporary structures are removed and reclaimed, and that all sedimentation ponds, diversions, impoundments and treatment facilities meet the requirements of R645-301 and R645-302 for permanent structures, have been maintained properly and meet the requirements of the approved reclamation plan for permanent structures and impoundments. Energy West Mining Company will renovate such structures if necessary to meet the requirements of R645-301 and R645-302 and to conform to the approved reclamation plan. For complete discussion related to the reclamation plan for the Rilda Canyon Portal Facilities refer to R645-301-540.

LIST OF REFERENCES

Danielson, T.W.; Remillard, M.D.; Fuller, R.H., Hydrology of the Coal-Resource areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah; U.S. Geological Survey-Water Resource Investigations, Open-File Report 81-539.

Doelling, H.H., 1972, Wasatch Plateau Coal Fields, in Doelling, H.H. (ed.), Central Utah Coal Fields; Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, Utah Geological and Mineralogical Survey Monograph Series No. 3, Salt Lake City, Utah.

Graham, M.J.; Tooley, J.E.; Price, D., Preliminary Hydrological Evaluation of the North Horn Mountain Coal-Resource Area, Utah, U.S. Geological Survey, Open-File Report 81-141.

Lines, G.C., The Ground-water System and Possible Effects of Underground Coal Mining in the Trail Mountain Area, Central Utah, U.S. Geological Survey, Open-File Report 84-067.

Price, D.; Arnow, T., Summary Appraisals of the Nation's Groundwater Resources-Upper Colorado Region, U.S. Geological Survey Professional Paper 813-C, Washington, D.C.

R645-301-700 HYDROLOGY SECTION

APPENDIX A

♦RESPONSE OF SPRINGS TO LONGWALL COAL MINING AT THE DEER CREEK AND COTTONWOOD MINES, WASATCH PLATEAU, UT

IC 9405

INFORMATION CIRCULAR/1994

Response of Springs to Longwall Coal Mining at the Deer Creek and Cottonwood Mines, Wasatch Plateau, UT

By Liane L. M. Kadnuck

United States Department of the Interior

Bureau of Mines

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

U.S. Department of the Interior
Mission Statement

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally–owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

Cover: Clockwise from top left: topography of East Mouintain Summit; typical topography of Wasatch Plateau; surveying instrument in winter snowpack, soure of recharge for local springs; spring I and the stock watering pond it creates.

Information Circular 9405

Response of Springs to Longwall Coal Mining at the Deer Creek and Cottonwood Mines, Wasatch Plateau, UT

By Liane L. M. Kadnuck

UNITED STATES DEPARTMENT OF THE INTERIOR
Bruce Babbitt, Secretary

BUREAU OF MINES

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

Library of Congress Cataloging in Publication Data:

Kadnuck, Liane L. M.
Response of springs to longwall coal mining at the Deer Creek and Cottonwood mines, Wasatch Plateau, UT / by Liane L.M. Kadnuck.

p. cm. — (Information circular / Bureau of Mines; 9405)

Includes bibliographical references (p. 11).

1. Coal mines and mining—Utah—Wasatch Plateau. 2. Rock mechanics—Utah—Wasatch Plateau. 3. Mine subsidence—Utah—Wasatch Plateau. 4. Springs—Utah—Wasatch Plateau. I. Title. II. Series: Information circular (United States. Bureau of Mines); 9405.

TN805.U8K33 1994 622'.334—dc20 94-15245 CIP

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

CONTENTS

	Page
Abstract	1
Introduction	2
Acknowledgments	2
Deer Creek and Cottonwood Mines study site	2
Geology	2
Regional geology	2
Local geology	3
Hydrologic system	3
Ground water hydrology	3
Surface water hydrology	5
Hydrologic data collection	6
Analysis of spring response to mining	7
Results and discussion	8
Summary	10
References	11
Appendix.—Hydrologic data graphs	12

ILLUSTRATIONS

1.	Project location map	2
2.	Generalized overburden stratigraphy	3
3.	Mine map showing spring locations	4
4.	Topography of East Mountain showing surface drainage	5
5.	Conceptual overburden failure schematic	10
A-1.	East Mountain precipitation for water years 1981-93	12
A-2.	Spring discharge hydrographs for water years 1981-93	13
A-3.	Cross-correlated spring and precipitation data	20
A-4.	Match position versus T value	21

TABLES

1.	Spring characteristics	6
2.	Ratios of panel width to overburden thickness for springs over panels	9

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

cm	centimeter	m	meter
km	kilometer	pct	percent
L/s	liter per second		

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

BUREAU OF MINES
SPRING CROSS REFERENCE

U.S. B. M. SPRING ID.	ENERGY WEST ID.
A	ELK SPRINGS
B	SHEBA SPRINGS
C	79-15
D	79-35
E	79-29
F	82-52
G	TED'S TUB
H	79-23
I	BURNT TREE
J	79-2
K	80-44
L	80-41
M	80-46
N	84-56

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

RESPONSE OF SPRINGS TO LONGWALL COAL MINING AT THE DEER CREEK AND COTTONWOOD MINES, WASATCH PLATEAU, UT

By Liane L. M. Kadnuck[1]

ABSTRACT

This report summarizes the results of a hydrologic research study conducted by the U.S. Bureau of Mines (USBM) in cooperation with Energy West Mining Co. at the Deer Creek and Cottonwood Mines, near Orangeville, UT. The USBM evaluated hydrologic and overburden failure data to assess the response of local ground water to underground coal mining in single- and multiple-seam conditions. Fourteen springs located over the two mines were investigated in the study along with overburden failure response caused by longwall panel extraction. Spring discharge was compared to climatic variation and time of undermining to quantify response to undermining. Spring discharge had been reduced owing to below-normal precipitation during the period evaluated. The response of springs to mining in the vicinity was influenced in part by the thick overburden present at the study site, the presence of hydrophilic clays and mudstones in the overburden stratigraphy, and elevation of the springs above the mine level, which buffered the effects of undermining.

[1]Environmental engineer, Denver Research Center, U.S. Bureau of Mines, Denver, CO.

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

INTRODUCTION

To quantify the response of overburden stratigraphy to high-extraction coal mining, the U.S. Bureau of Mines (USBM) initiated a research program to evaluate the effects of mining and associated subsidence in varying geologic conditions. The primary objective of this program is to understand the mechanics of subsidence and overburden failure response resulting from underground mining in Western U.S. coalfields. Previous USBM studies have focused on surface effects of underground coal mining *(1-5)*.[2] Recognizing that subsidence produces alterations in overburden characteristics which in turn produce associated changes in the hydrologic system, the program was expanded to include characterization of the response of hydrologic systems contained in the overburden. This study addresses the effects of overburden failure on hydrologic resources in proximity to a mined area.

This report describes the response of ground water contained in the overburden to underground mining in the Wasatch Plateau Coalfield. The study involved evaluating the response of local ground water resources overlying the Deer Creek and Cottonwood coal mines in Emery County, UT. The goals of this study were to (1) quantify fluctuations in spring discharge associated with undermining, (2) assess longevity of discharge fluctuations, and (3) correlate the stratigraphic locations and elevations of springs in the overburden stratigraphic column with zones of overburden failure.

ACKNOWLEDGMENTS

PacifiCorp's Fuel Resources Division provided valuable assistance in performing this research. Specifically, Chuck Semborski of the Energy West Mining Co. and Rodger Fry of InterWest Mining contributed much of the data and information contained in this report. Without their assistance, this study could not have been undertaken.

DEER CREEK AND COTTONWOOD MINES STUDY SITE

The Deer Creek and Cottonwood Mines are located in the Wasatch Plateau Coalfield in south-central Utah (figure 1). Two major coal seams are mined in the area by Energy West Mining Co., a subsidiary of PacifiCorp.; the Deer Creek Mine operates in the Blind Canyon Seam, and the Cottonwood Mine produces coal from the Hiawatha Seam approximately 26 m below. The Deer Creek Mine overlies and partly overlaps the Cottonwood Mine; hence the study area contains areas of both single- and multiple-seam mining. The mines are located on East Mountain (elevation 2,942 m). The local topography is typified by rugged mountains dissected by stream-incised canyons. The overburden thickness averages 518 m but ranges from 260 to over 700 m, depending on local topography.

[2]Italic numbers in parentheses refer to items in the list of references preceding the appendix.

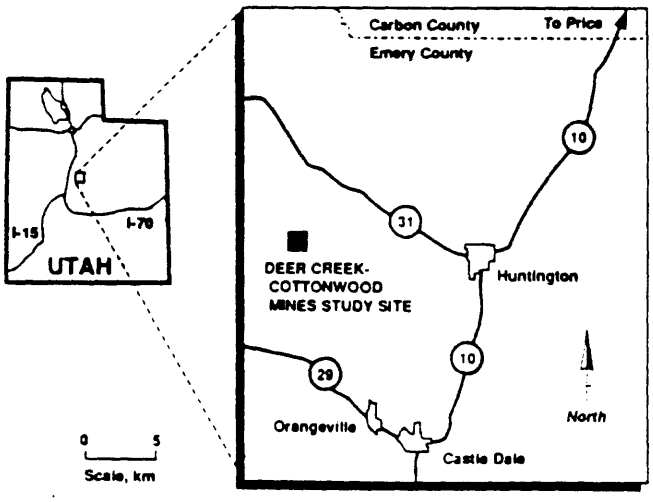


Figure 1.—Project location map.

Both mines currently extract coal using longwall retreat methods, and each contains areas of past room-and-pillar extraction. The coal is hard, dense, and ranked B to C bituminous. The Deer Creek Mine operates at an average extraction height of 3.3 m, and the Cottonwood Mine has an average extraction height of 2.6 m.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
GEOLOGY

Regional Geology

The mines are located on the Wasatch Plateau, a broad, north-south-trending, flat-topped mesa. The eastern edge of the plateau lies on the western flank of the San Rafael Swell and is typified by gently westward-dipping strata. The western edge of the plateau is complexly faulted and represents the transition between the Colorado plateau

UTAH DIVISION OIL, GAS AND MINING

region and the Great Basin. Geologic units outcropping in the area range in age from Cretaceous to Tertiary, with some thin, unconsolidated Quaternary deposits present in stream valleys.

Local Geology

Exposed strata in the mine area are of sedimentary origin. The economic coal deposits are found in the lower part of the stratigraphic section. Generalized lithologies and thicknesses of each geologic unit are summarized in figure 2 *(6)*.

The youngest geologic unit in the area, the Flagstaff Limestone, is a freshwater limestone that caps portions of the top of East Mountain. The Flagstaff is underlain by the North Horn Formation, a variegated shale and mudstone sequence derived from fluvial and lacustrine origins. The Price River Formation forms a steep, receding slope under the North Horn and consists of a conglomeratic fluvial sandstone with shale layers. The North Horn and Price River Formations each contain claystones and mudstones that are rich in hydrophilic clays. The fluvial Castlegate Sandstone forms a cliff between the Price River and Blackhawk Formations. The Blackhawk Formation is a marginal marine sequence of lenticular sandstone beds and carbonaceous shales with economic coal deposits. The Blackhawk is typified as having fluvial channels scoured into the top of the coal deposits. Underlying the Blackhawk is the Star Point Sandstone, a thinly bedded marine sandstone with shale interbeds at the base where it intertongues with the older Masuk Shale Member of the Mancos Formation.

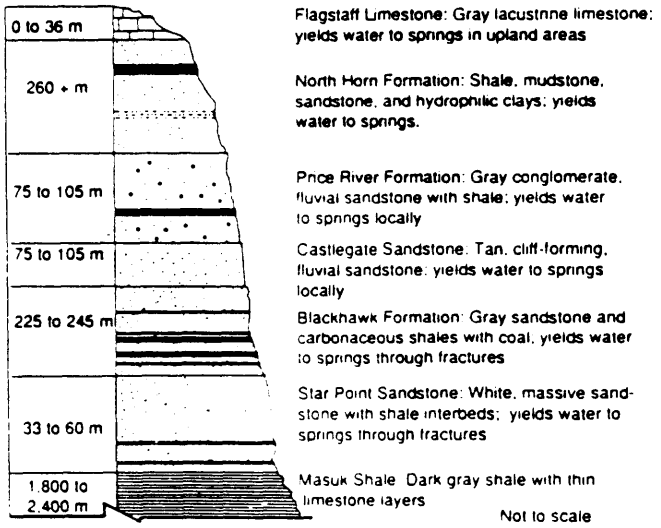


Figure 2.—Generalized overburden stratigraphy (modified from Danielson and others (7)).

The regional dip of the strata is broken by the northeast-trending axis of the Straight Canyon syncline, located on the western end of East Mountain. Faulting is common on the Wasatch Plateau, and three faults, the Deer Creek, Pleasant Valley, and Roan's Canyon, crosscut the permit area *(6)*. Jointing is also prevalent in the area, and joint sets trending northeast-southwest and northwest-southeast crosscut the study area. Figure 3 shows the locations and trends of the major structural features.

HYDROLOGIC SYSTEM

Ground Water Hydrology

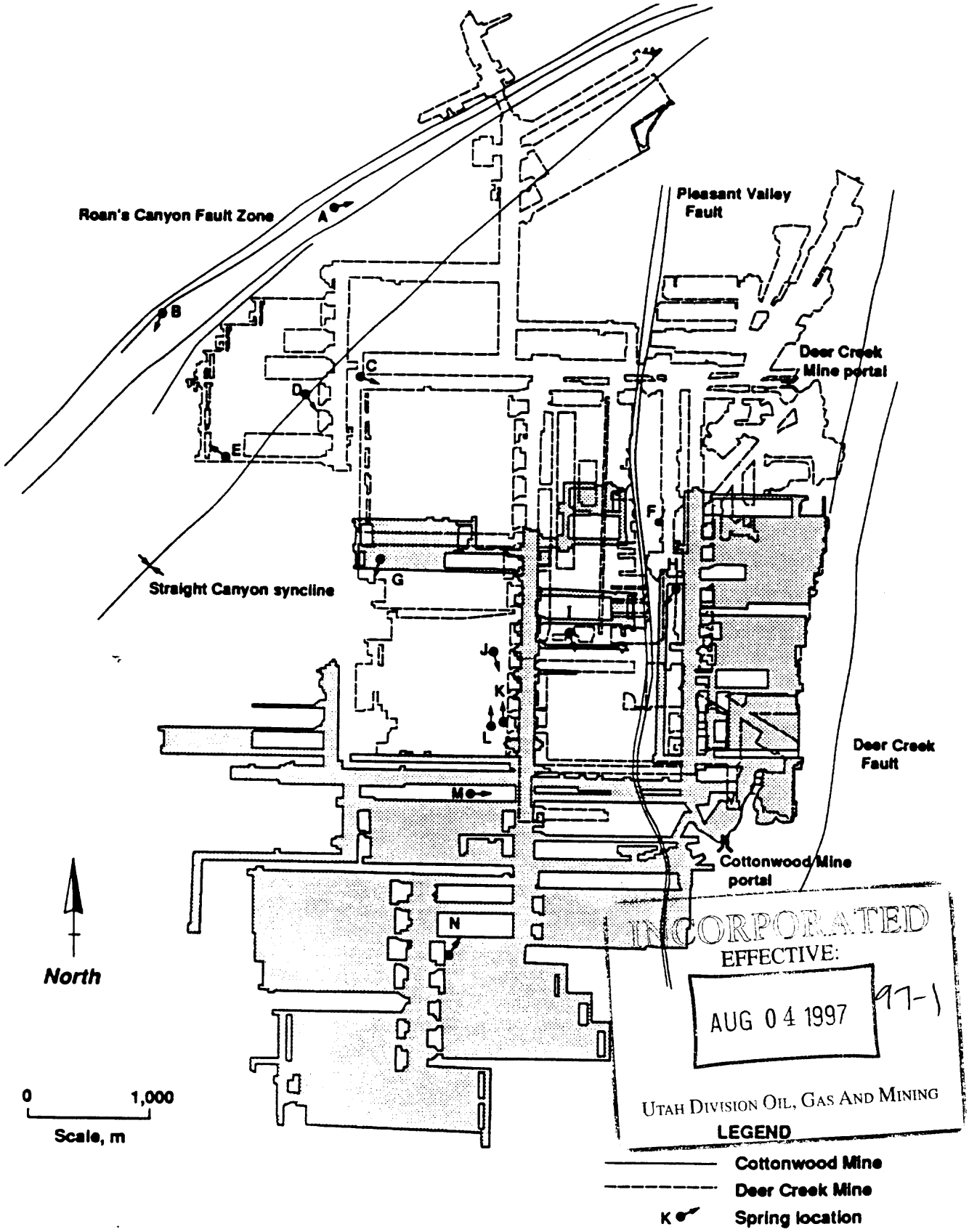
Ground water occurs in all exposed geologic units discussed in the previous section in continuous or discontinuous water-bearing zones. The formations yield ground water from perched zones[3] to springs[4] where the hydraulic conductivity of the water-bearing zone is higher than that of the surrounding rock, and where the formations are fractured or faulted. The lateral continuity of these perched water tables is not known, though there is some evidence for limited lateral extent based on springs located at the same elevation *(6)*. The lateral extent of water-bearing zones is limited based on the discontinuous nature of the local topography. A continuous water-bearing unit was found to be present in the Star Point sandstone through drillers' logs and regional ground water studies.

Ground water in the area is recharged largely from precipitation, most of it from snowmelt, which percolates into the subsurface through fractures or matrix flow *(9)*. The flat top of East Mountain allows water to infiltrate to the subsurface through fractures exposed at the surface. Some recharge also infiltrates to the subsurface on the mountain flanks. Older units are recharged mainly from water that migrates through fractures. Impermeable lenses of shale and mudstone in the North Horn and Price River Formations retard downward migration of water, although some water is transmitted to the lower geologic units through continuous fractures. Geotechnical tests performed on the North Horn Formation indicated hydrophilic or swelling materials were present in the clays and mudstones that swelled 40 pct in the first hour of testing *(10)*. As a result, a large number of springs issue from the North Horn and Price River Formations. The Star Point Sandstone and the Blackhawk Formation are recharged from overlying units, mainly through faults and fractures *(6)*.

[3]By definition, perched water is "unconfined ground water separated from an underlying main body of ground water by an unsaturated zone" *(7)*.

[4]By definition, springs are a place where ground water flows naturally from a rock or the soil onto the land surface or into a body of water, and the occurrence depends upon the nature and relationship of rocks, especially permeable and impermeable strata *(8)*.

INCORPORATED
EFFECTIVE: AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING



INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

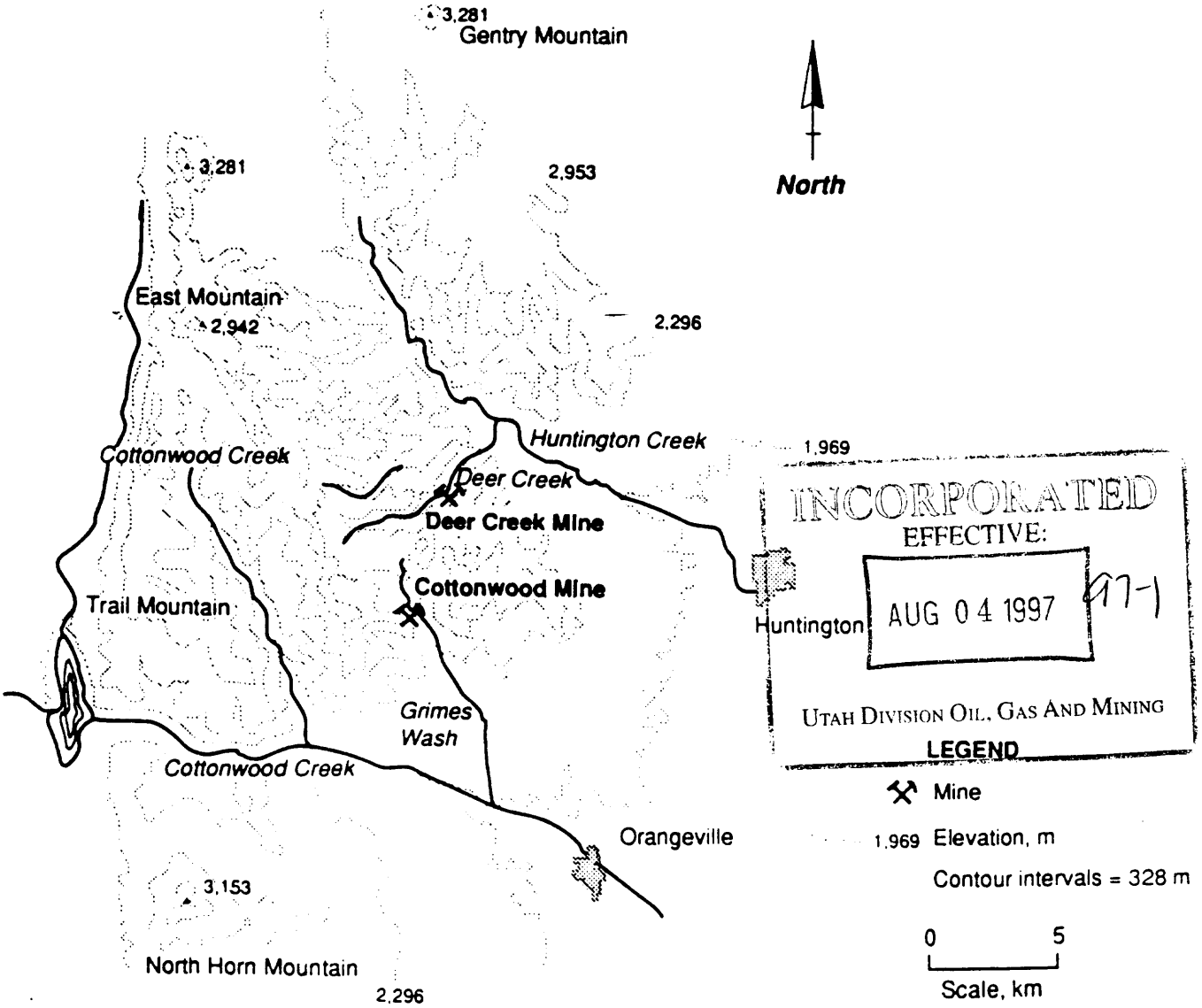
Figure 3.—Mine map showing spring locations.

Water movement is controlled by dip of bedding, primary hydraulic conductivity, and fractures. Regional ground water flow in the immediate area is affected by the Joes Valley and Pleasant Valley fault zones, which are thought to be major conduits of interbasin flow. Water-bearing fractures encountered in the mines further indicate that ground water is transported along faults and fractures *(10)*.

Surface Water Hydrology

As shown on figure 4, East Mountain forms a drainage divide between Huntington Creek to the north and Cottonwood Creek on the south. The north fork of Cottonwood Creek drains the area between Trail and East Mountains, while Huntington Creek drains the area between East Mountain and Gentry Mountain to the north. There are numerous tributaries to these creeks, most of which are ephemeral, flowing only during precipitation events, or intermittent, flowing during wet seasons of the year.

Most of the overland drainage is derived from snowmelt, and most baseflow in the streams originates as ground water discharged from perched aquifers issuing water to springs *(6, 11)*. Large fracture systems associated with the fault zones in the area are thought to control the surface drainage and may intercept creek flow and divert it into other basins. A lineament analysis *(12)* coupled with a drainage trace analysis indicated that the major trunk streams follow a regional northwest-southeast trend and that tributary drainages follow either a north-south, east-west, or northeast-southwest trend. The linearity of the drainage traces suggests that the surface drainage is following fracture or joint systems.



INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

Figure 4.—Topography of East Mountain showing surface drainage.

HYDROLOGIC DATA COLLECTION

The mining company is required by law to monitor quantity of water resources within the permit area. Monitoring includes spring and stream discharge, piezometric levels in the mine floor, and mine discharge from both the Deer Creek and Cottonwood Mines. This study focused on ground water resources located above the mine level, namely springs, that could potentially be affected by mining. Springs issuing from East Mountain within the Deer Creek and Cottonwood Mines permit area were chosen by PacifiCorp and the Utah Division of Oil, Gas and Mining to be monitored for discharge and water quality. Thirty springs within the permit area are monitored, some on a semiannual basis and some on a monthly basis. Discharge monitoring was started in 1979, and additional springs have been added each year since that time; thus records vary for all the springs monitored. Discharge is measured by weirs, flumes, or manually. The 14 springs selected for use in this study were those with the longest available monitoring records. The springs monitored on a monthly basis are measured from July through October, since they are inaccessible during winter months. Discharge is reported from annual runoff through baseflow in the fall.

The monitoring is performed to allow comparison and assessment of the effects that mining has on the springs. The springs were characterized by mine personnel for issuing mechanism (for example, a fracture or a perched zone), issuing formation, and elevation measurements taken. This information is provided in table 1.

Water enters the mines through faults, fractures, and drill holes, and where localized saturated zones (fluvial sandstone channels) are intercepted by mine workings. Water discharged from the mines is measured at the discharge point on a daily basis and reported as a monthly total. Mine water from the Cottonwood Mine is discharged into Grimes Wash, and water from the Deer Creek Mine is discharged into Huntington Creek (figure 4).

Table 1.—Spring characteristics

Spring	Geologic unit	Issuing mechanism	Elevation, m	Location	Date undermined
A	North Horn	Fracture	2,850	Not in mined area	Not applicable.
B	Flagstaff	..do.	2,969	..do.	Do.
C	North Horn	..do.	2,831	Deer Creek barrier pillar	Do.
D	Flagstaff	Formation contact	2,921	Deer Creek panel	Oct. 1991.
E	North Horn	Perched zone	2,868	..do.	Feb. 1992.
F	Price River	..do.	2,743	Deer Creek barrier pillar	Not applicable.
G	North Horn	Fracture	2,831	Deer Creek panel	Apr. 1988.
H	..do.	Formation contact	2,754	Deer Creek mains, Cottonwood pillar	May 1976.
I	..do.	Perched zone	2,822	Deer Creek submains, Cottonwood panel	Aug. 1993.
J	..do.	..do.	2,831	Deer Creek panel	Aug. 1986.
K	Price River	Fracture	2,737	..do.	Dec. 1982.
L	..do.	Perched zone	2,743	..do.	Aug. 1982.
M	North Horn	..do.	2,850	Cottonwood barrier pillar	Not applicable.
N	..do.	Fracture	2,845	Cottonwood panel	Aug. 1989.

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

ANALYSIS OF SPRING RESPONSE TO MINING

This study concentrates on characterizing the impacts mining has on perched water-bearing zones in the overburden. In the study area, water-bearing zones above the mine level issue water to springs, representing an important part of water supply in the region for stream baseflow, agricultural, irrigation, and wildlife habitat purposes. Fourteen springs located on East Mountain were targeted for study based on availability of monitoring records and proximity to the mines and were designated with a letter identifier of A to N. Analysis of spring response followed a method used by Coe and Stowe (*13*), which is one of the few published studies that have examined responses of springs to undermining. This methodology required use of information sets including precipitation, spring discharge, and time of undermining.

This method involved comparing spring discharge hydrographs to precipitation for the period of monitoring. Monthly and total annual precipitation data for water years[5] 1981 to 1993 were utilized and are shown on figure A-1 in the appendix. Precipitation data are collected at a weather station on East Mountain on a daily basis. The availability of seasonal, monthly discharge data dictated using seasonal recession curves to assess mining impacts by determining if the springs departed from normal response. Patterns or trends in the spring discharge recession curves were sought to assess if the springs showed similar responses each year to precipitation, runoff, and baseflow conditions. Curves were compared to one another to discern if springs in the area responded differently based on issuing mechanism (fracture versus perched zone). There did not appear to be large differences in response as a result of issuing mechanism. Several years of data prior to mining were incorporated to establish baseline conditions. Spring discharges, shown as seasonal recession curves, are given on figure A-2.

Initial comparison of spring discharge to precipitation indicated that discharge did not immediately follow precipitation. Therefore, a statistical analysis that cross-correlated precipitation data with spring discharge was performed for two of the springs. This analysis showed that the springs in the study area respond to precipitation events within 6 months to 1 year *(14)*. Discharge data for springs I and M were correlated with precipitation; this indicated that there is an approximate 6-month to 1-year lag time between precipitation events and discharge. The lag information was used to better assess variations due to climatic events without confusing them with response that may have been a result of mining. Results of the statistical analysis are given graphically on figure A-3. The graphs show the calculated lag time by offsetting the spring flow hydrograph by 1 year on the precipitation curve; for example, spring flow for 1982 is placed over precipitation for 1981. Local variation of lag time is expected based on differences in elevation, recharge source, and issuing mechanism for each of the springs studied. The statistical correlation gives an indication of the approximate lag time for the area. Figure A-4 gives the statistical results showing match position and correlation coefficient to demonstrate the validity of the correlation of the two data sets.

Spring discharge variation of both preundermining and postundermining was evaluated to identify if the spring discharge changed as the spring was undermined, or as mining progressed close by. Each spring location was compared with a map of mine workings and located with regard to placement over a mine structure such as a panel or a barrier pillar, as shown on figure 3. This information is also listed on table 1. Springs D, E, G, I, J, K, L, and N are located over longwall panels. Springs C, F, H, and M are located over other mine structures such as barrier pillars or mains. Springs A and B are located in an area that has not been undermined and were thus used as controls to identify discharge fluctuations due to climatic events. Spring discharge was carefully compared with precipitation, location of the spring over the extracted area, and time of undermining to assess response.

[5]The water year runs from October 1 to September 30.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

RESULTS AND DISCUSSION

Spring A

Possible responses of springs to coal extraction include enhanced recharge to the spring from dilation of pre-existing fractures, reduction of spring discharge due to drainage into subsidence-induced fractures or dilation of existing fractures, or flow loss along planes of bedding separation *(9)*. Springs located over panels are expected to show a greater response to undermining than those located over mains or barrier pillars since most subsidence, and hence overburden deformation, occurs over the longwall panels. In a study in Appalachia where the overburden ranged from 120 to 245 m, rapid and dramatic decreases in spring discharge were observed as the longwall face passed underneath *(13)*. Trevits and Matetic observed a similar response in water wells located over longwall panels with 70 to 210 m of overburden present *(15)*. With the longwall mining method, subsidence occurs quickly after the coal is extracted as the immediate mine roof caves in behind the active face. Reports from mine personnel indicate that the majority of subsidence occurs at the site over single panels within 1 month after undermining.[6] Previous USBM studies reported that maximum subsidence occurred at these mines within a year where a group of panels had been extracted *(1, 3)*. Given these observations, hydrologic response is expected to occur within a similar timeframe as overburden response. As soon as the overburden fractures and moves in response to coal extraction and roof caving, the hydrologic system is also altered. The expected response of springs would be dramatic changes in discharge after undermining occurred.

Springs A and B were located outside the area disturbed by mining and provided information on the normal seasonal response of springs in the area to precipitation or recharge. From 1986 to 1992, precipitation in the area was 70 to 85 pct of normal. The recession curves for these springs show a general downward trend from 1986, in response to the decreased precipitation during that period. Precipitation increased in 1993 and is shown in the increase in spring discharge on the hydrographs (figure A-2). The shapes of the recession curves show smooth and repeatable patterns for the period of record.

Spring I is used as a water source for a stock watering pond. It was undermined by submains in the Deer Creek Mine in 1985, and by a longwall panel in the Cottonwood Mine in August 1993. It was noted that the recession curves departed from a normal shape coincident with mining activity underneath spring I. However, adjustments of valves and blockage in the pipe installed at the spring also occurred during this time, and available data do not allow for distinguishing the effects of the two activities. Weekly discharge measurements were available after the longwall panel passed underneath. Although surface tension cracks appeared in the vicinity, the spring discharge remained constant at 0.6 L/s. According to aerial surveys, the surface subsidence in the vicinity of spring I ranged from 0.6 to 1.2 m.

Spring E was undermined by a Deer Creek panel in February 1992. This spring exhibited inconsistent recession curves in the 5 years prior to undermining and then had a flat recession curve in the year after undermining. The surface subsidence at spring E was estimated to be 1.6 to 1.8 m. The spring has a very low discharge, making detection of discharge alteration more difficult. It is felt that the discharge alteration for this spring is a result of reduced recharge available from the decrease in precipitation.

Spring N was undermined by a Cottonwood panel in August 1989. The recession curves for the spring have a less consistent shape than those for springs A and B, although the shapes of the spring N curves are repeated over several years. The spring exhibits the same response both before and after undermining and also shows a general downward trend from 1986 due to decreased precipitation. The surface subsidence in the vicinity of spring N was 0.6 to 1.2 m. Given the repeatable nature of the recession curves, spring N does not appear to have been affected by mining.

The remaining springs located over panels and springs located over pillars or mains did not exhibit discernible effects from undermining.

Springs H, K, L, and M exhibited flat recession curves at some point during the period of monitoring. In these cases, the springs were reduced to low or no flow. These springs experienced no-flow conditions for several years corresponding to the drought years. Flow returned in springs K, L, and M in 1993; spring H had not recharged

[6]Personal communication with C. A. Semborski, Energy West Mining Co., Sept. 1993.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

to normal flow by 1993. The flat curves are likely due to depleted recharge from precipitation to the spring source or to depleted storage. Springs D and N each had 1 year where the recession curves were flat, but returned to normally shaped curves the following year. In these cases, the flat recession curves did not correspond to times of undermining. The control springs, A and B, did not show flat recession curves during the period of study, which is likely a result of fracture recharge conditions and locations at high elevations.

The undermined springs do not show the dramatic decreases in flow that have been observed in other studies. The lack of dramatic effects and the limited response observed may be attributed to several factors. One factor is that the springs that have been undermined are situated above the panels at ratios of panel width to overburden thickness (between the spring and the mine level) greater than 1.0. In a study by Tieman and Rauch (*16*), partial to total dewatering was observed in springs that were located above the panels at panel width to overburden ratios of 0.75 to 1.0. Table 2 summarizes the range of panel width to overburden ratios for springs undermined by panels evaluated in this study. Since the ratios are greater than 1.0 for the springs in this study, dewatering would not be anticipated, based on the observations made by Tieman and Rauch. This does not preclude minor discharge variations occurring as a result of strata movement or stress redistribution. Table 2 also lists the estimated surface subsidence in the vicinity of the springs located over panels.

Table 2.—Ratios of panel width to overburden thickness for springs over panels

Spring	Ratio of panel width to overburden thickness	Surface subsidence, m
D	1.1	0.6 - 1.2
E	1.3	1.2 - 1.8
G	1.1	0.6 - 1.2
I	1.2	0.6 - 1.2
J	1.3	0.6 - 1.2
K	1.2	< 0.6
L	1.1	0.6 - 1.2
N	1.1	0.6 - 1.2

The limited response observed for the springs was thought to be influenced by site-specific conditions that buffered the effects of mining. These include the thick overburden present and the presence of formations in the overburden that contain hydrophilic clays and mudstones. Results from other studies have concluded that the presence of hydrophilic clays lessens the extent of strata dewatering *(13, 17)*. Additionally, the presence of a massive sandstone layer (the Castlegate Sandstone) can cause bridging in the overburden, thereby limiting subsidence and associated hydrologic response *(1)*.

Another factor contributing to the limited spring response was the elevations of the springs above anticipated heights of fracturing and caving in the overburden, as estimated using formulas developed by Peng *(18)*. The relationship of fracture height equal to 30 times mining thickness was used. This relationship was developed based on mining conditions common to Eastern U.S. coalfields and does not account for differences in Western U.S. conditions such as the presence of massive sandstones in the overburden or thicker overburden. However, no similar value has been developed for the West, so the published relationship is commonly applied. Use of the relationship indicated that overburden fracturing might occur up to an elevation of 2,400 m from the Deer Creek Mine and up to approximately 2,330 m from the Cottonwood Mine. Spring K was the lowermost spring studied and was located at 2,737 m, 337 m above the computed height of fracturing. For the case that both coal seams had been extracted, gob formation and fracturing associated with mining the second lower seam would be incorporated into the fracturing produced by mining the first upper seam.[7] A conceptual subsurface overburden failure schematic is shown on figure 5.

Although all the springs studied were located at elevations higher than the computed elevations of fracturing in the overburden, the springs were located in a zone of the overburden where, according to Peng, continuous bending of the strata occurs. Preexisting fractures can dilate in response to the bending, causing flow variation. The bending and redistribution of stresses in the overburden can also cause flow variations.

[7]Personal communication with C. Haycocks, Department of Mining Engineering, Virginia Polytechnic Institute, Aug. 1993.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

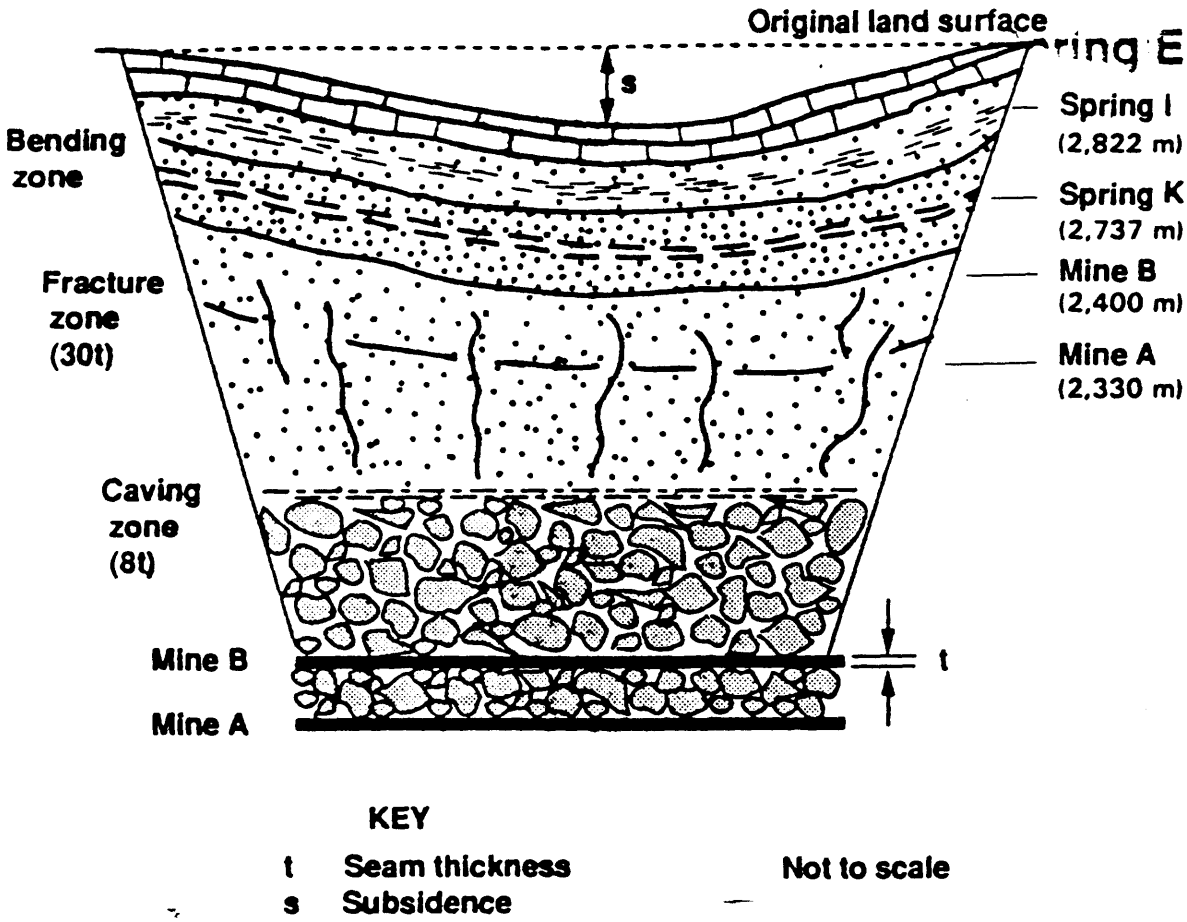


Figure 5.—Conceptual overburden failure schematic.

SUMMARY

The USBM used data available from the Deer Creek and Cottonwood Mines to perform a study of underground coal mining effects on local overburden hydrology. Data used in the study included seasonal and annual spring discharge, precipitation, surface subsidence, and overburden failure mechanics information. These data sets were used to quantify the response of 14 springs to underground mining.

Eight springs occurred over longwall panels. One of the eight, spring I, exhibited a departure from a normal recession curve coincident with the time of mining activity underneath it. Adjustments to valves and blockage of a pipe installed at the spring also occurred in the same time period and contributed to the variations in curve shape. The spring exhibited a constant discharge rate in the weeks after being undermined by a longwall panel, indicating that little variation occurred as a result of mining. The eight springs over panels all occurred at locations where the ratio of panel width to overburden thickness was greater than 1.0, thus limiting dewatering effects, as was observed in previous studies in Eastern U.S. coalfields. Surface subsidence did not appear to play a major role in the response of springs at this site.

Four springs experienced no discharge conditions during the period of study that were attributed to effects of regional decreased precipitation. Springs located over mine structures such as pillars or mains did not exhibit discernible effects from mining. For this study, the long-term availability of water resources was important and therefore dictated examining the seasonal response of springs in relation to mining.

The expected response of springs to undermining would be dramatic alterations in flow, as previously documented in other studies. The lack of observed responses was attributed to geologically driven site-specific conditions that buffered the effects of mining. These conditions included the thickness of overburden between the mine level and the springs, which ranged from 440 to over 600 m. Studies performed in the Appalachian coalfields noted dramatic decreases in spring discharge and water levels in wells

UNCONTROLLED EFFECTIVE AUG 04 1997 971 STATE OF OHIO DIV. OF GEOLOGY AND MINING

where thinner (70 to 245 m) overburden was present *(13, 15, 17)*. Additionally, the presence of hydrophilic clays and mudstones in the overburden, which act as aquitards retarding the migration of water, likely lessened the vertical extent of strata dewatering, as has been observed in other studies *(17)*. The location of the springs above the estimated elevations of fracturing and caving in the overburden due to subsidence also contributed to the limited effects.

REFERENCES

1. Allgaier, F. K. Surface Subsidence Over Longwall Panels in the Western United States-Final Results at the Deer Creek Mine, Utah. USBM IC 9194, 1988, 17 pp.
2. ____. Surface Subsidence Over Longwall Panels in the Western United States, Monitoring Program and Preliminary Results at the Deer Creek Mine, Utah. USBM IC 8896, 1982, 24 pp.
3. Dyni, R. C. Subsidence Resulting From Multiple-Seam Longwall Mining in the Western United States-A Characterization Study. USBM IC 9297, 1991, 20 pp.
4. Fejes, A. J. Surface Subsidence Resulting From Longwall Mining in Central Utah-A Case Study. Paper in Proceedings of 26th U.S. Symposium on Rock Mechanics. SD Sch. Mines and Technol., Rapid City, SD, 1985, pp. 197-204.
5. Magers, J. A. Surface Subsidence Over a Room-and-Pillar Mine in the Western United States. USBM IC 9347, 1993, 15 pp.
6. Lines, G. C. The Ground-Water System and Possible Effects of Underground Coal Mining in the Trail Mountain Area, Central Utah. U.S. Geol. Surv. Water-Supply Paper 2259, 1985, 32 pp.
7. Danielson, T. W., M. D. ReMillard, and R. H. Fuller. Hydrology of the Coal-Resource Areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah. U.S. Geol. Surv. Open-File Rep. 81-539, 1981, 85 pp.
8. Bates, R. L., and J. A. Jackson. Glossary of Geology. Am. Geol. Inst., 3rd. ed., 1987, 788 pp.
9. Thiros, S. A., and G. E. Cordy. Hydrology and Potential Effects of Mining in the Quitchupah and Pines Coal-Lease Tracts, Central Utah. U.S. Geol. Surv. Water-Resour. Invest. Rep. 90-4084, 1991, 63 pp.
10. PacifiCorp Fuel Resources Division (Huntington, UT). Hydrologic Monitoring Program Annual Reports, 1980-92.
11. Danielson, T. W., and D. A. Sylla. Hydrology of Coal-Resource Areas in the Southern Wasatch Plateau, Central Utah. U.S. Geol. Surv. Water-Resour. Invest. Rep. 82-4009, 1983, 66 pp.
12. Peters, D. C., and R. A. Speirer. A Case History of Computer-Aided Lineament Analysis for Ground Control Planning. Paper in Proceedings of 5th Conference on Ground Control in Mining. WV Univ., Morgantown, WV, 1986, pp. 191-205.
13. Coe, C. J., and S. M. Stowe. Evaluating the Impact of Longwall Coal Mining on the Hydrologic Balance. Paper in Proceedings of the National Water Well Association Conference on the Impact of Mining on Ground Water. Natl. Water Well Assoc., 1984, pp. 348-359.
14. Davis, J. C. Statistics and Data Analysis in Geology. Wiley, 2nd ed., 1986, 646 pp.
15. Trevits, M. A., and R. J. Matetic. A Study of the Relationship Between Saturated Zone Response and Longwall Mining-Induced Ground Strain. Paper in Proceedings of National Water Well Association Fifth Outdoor Action Conference. Natl. Water Well Assoc., 1991, pp. 1101-1109.
16. Tieman, G. E., and H. W. Rauch. Study of Dewatering Effects at an Underground Longwall Mine Site in the Pittsburgh Seam of the Northern Appalachian Coalfield. Paper in Eastern Coal Mine Geomechanics. Proceedings: Bureau of Mines Technology Transfer Seminar, Pittsburgh, PA, November 19, 1986. USBM IC 9137, 1987, pp. 72-89.
17. Rauch, H. W. A Summary of the Ground Water Impacts From Underground Mine Subsidence in the North Central Appalachians. Ch-in Coal Mine Subsidence Special Institute. Eastern Mineral Law Foundation, 1989, pp. 2.01-2.31.
18. Peng, S. S. Surface Subsidence Engineering. SME, 1992, 161 pp.
19. Gordon, N. D., T. A. McMahon, and B. L. Finlayson. Stream Hydrology, An Introduction for Ecologists. Wiley, Brisbane, Queensland, Australia, 1992, 526 pp.

INCORPORATED
EFFECTIVE:
AUG 04 1997 97-1
UTAH DIVISION OIL, GAS AND MINING

APPENDIX.—HYDROLOGIC DATA G:

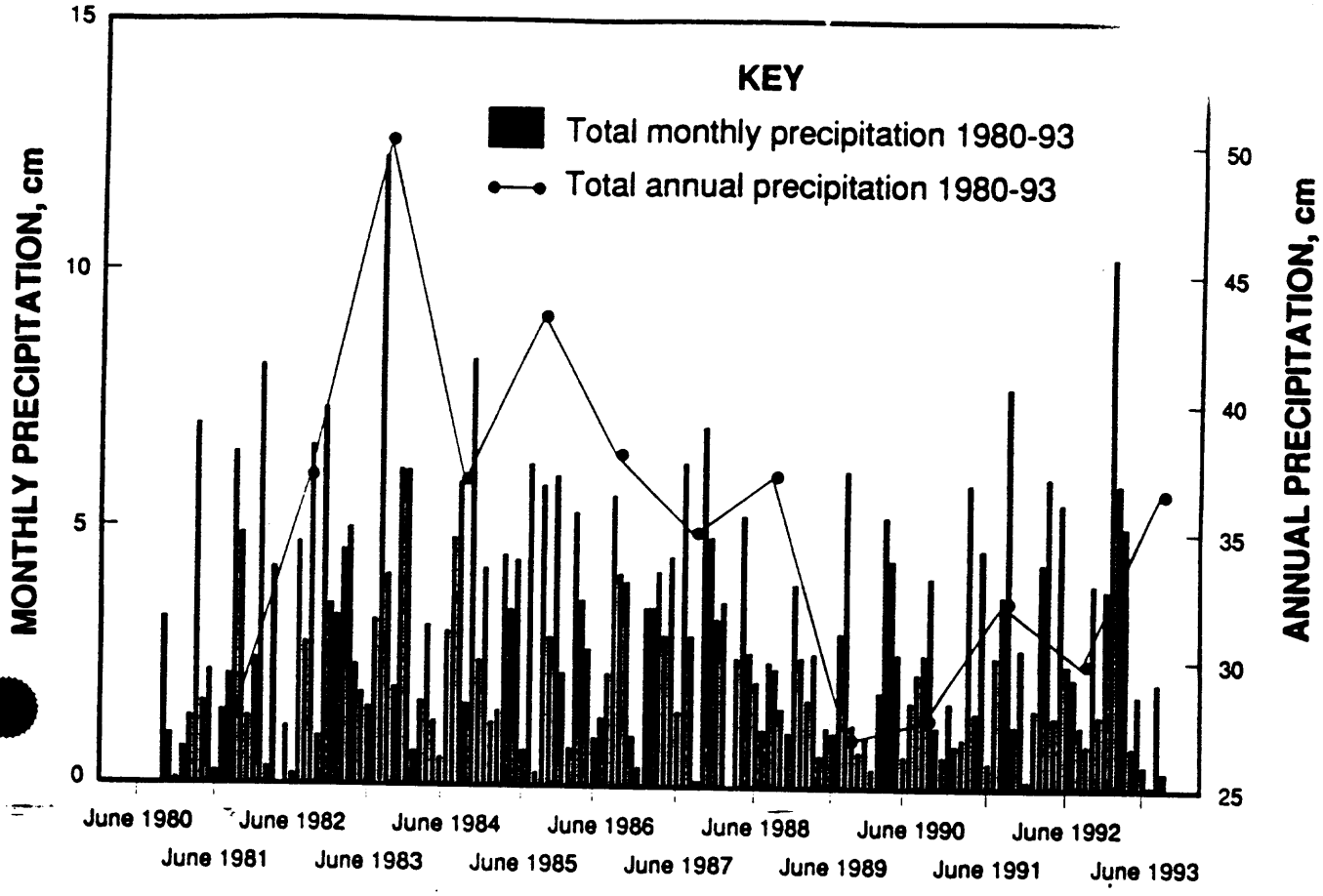


Figure A-1.—East Mountain precipitation for water years 1981-93.

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

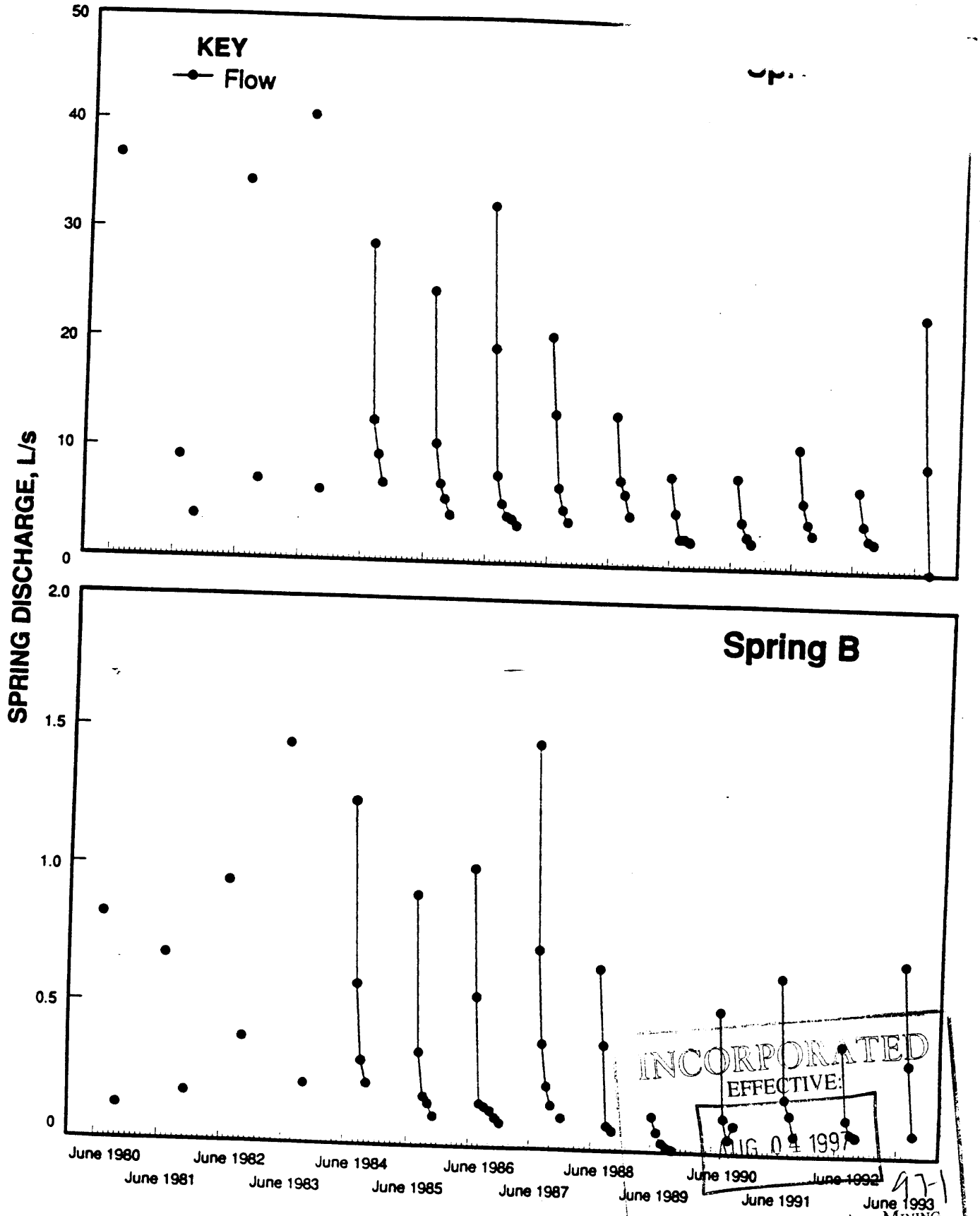


Figure A-2.—Spring discharge hydrographs for water years 1981-93.

INCORPORATED
EFFECTIVE:
AUG 04 1997
DIVISION OIL, GAS AND MINING

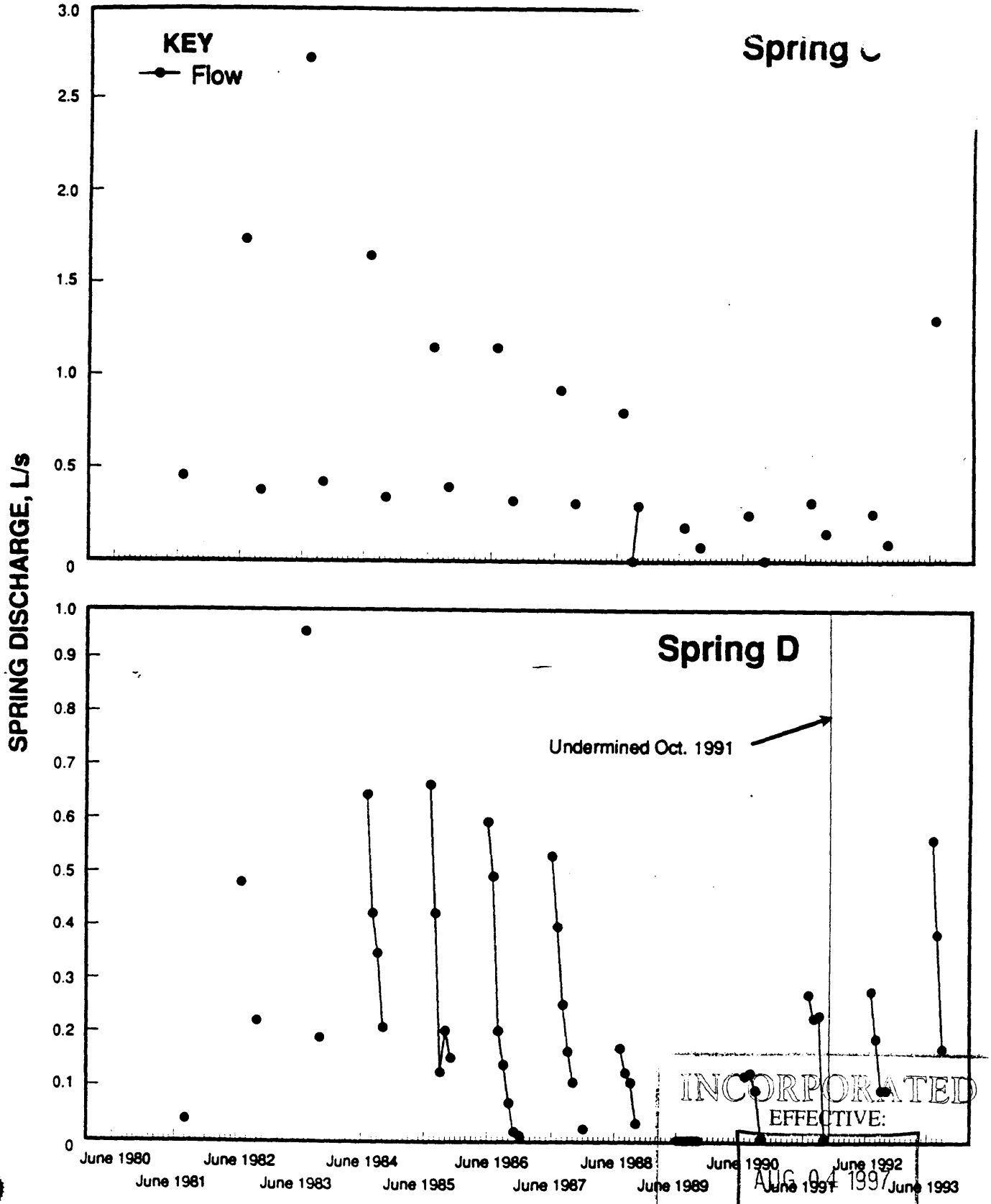


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

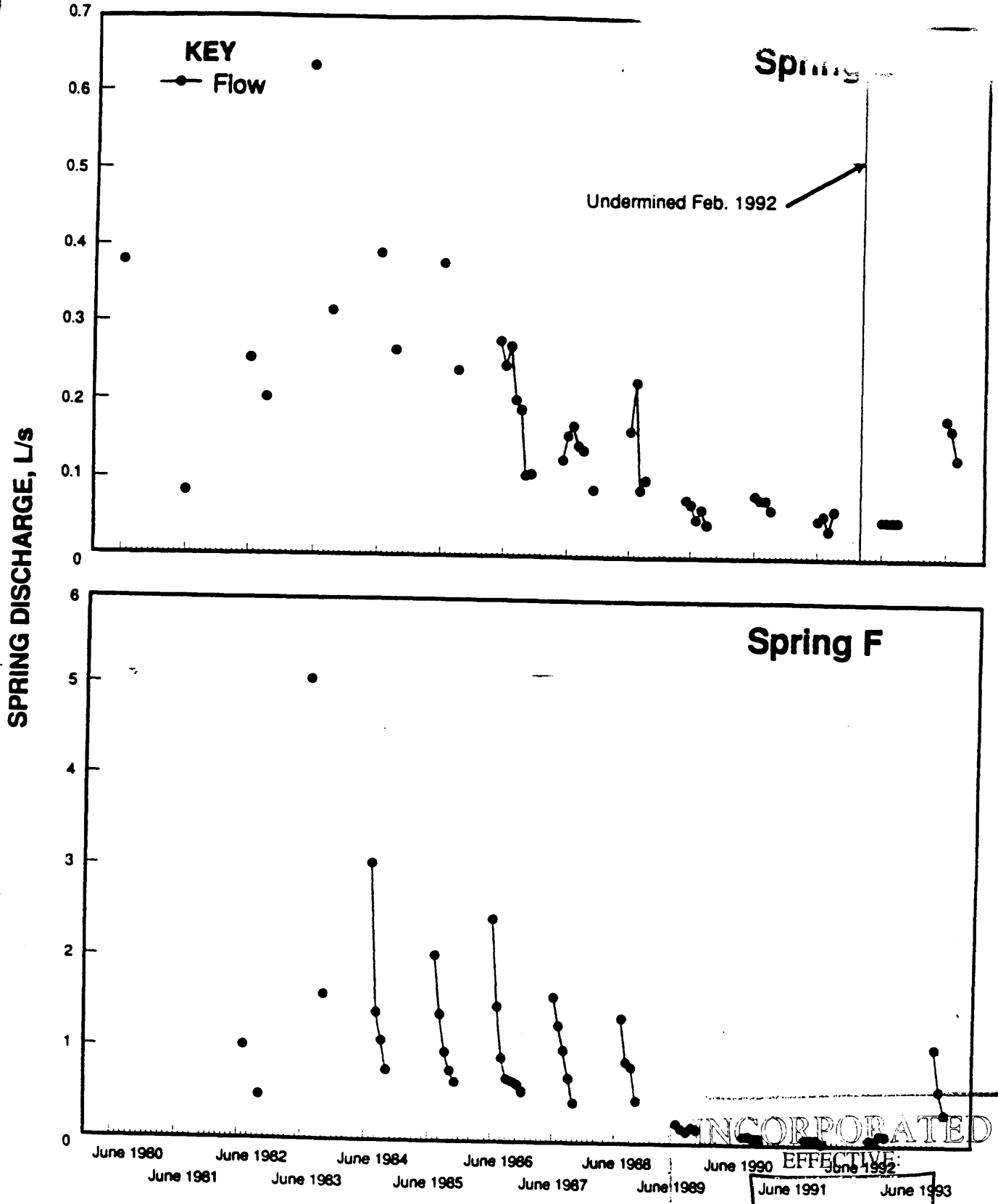


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

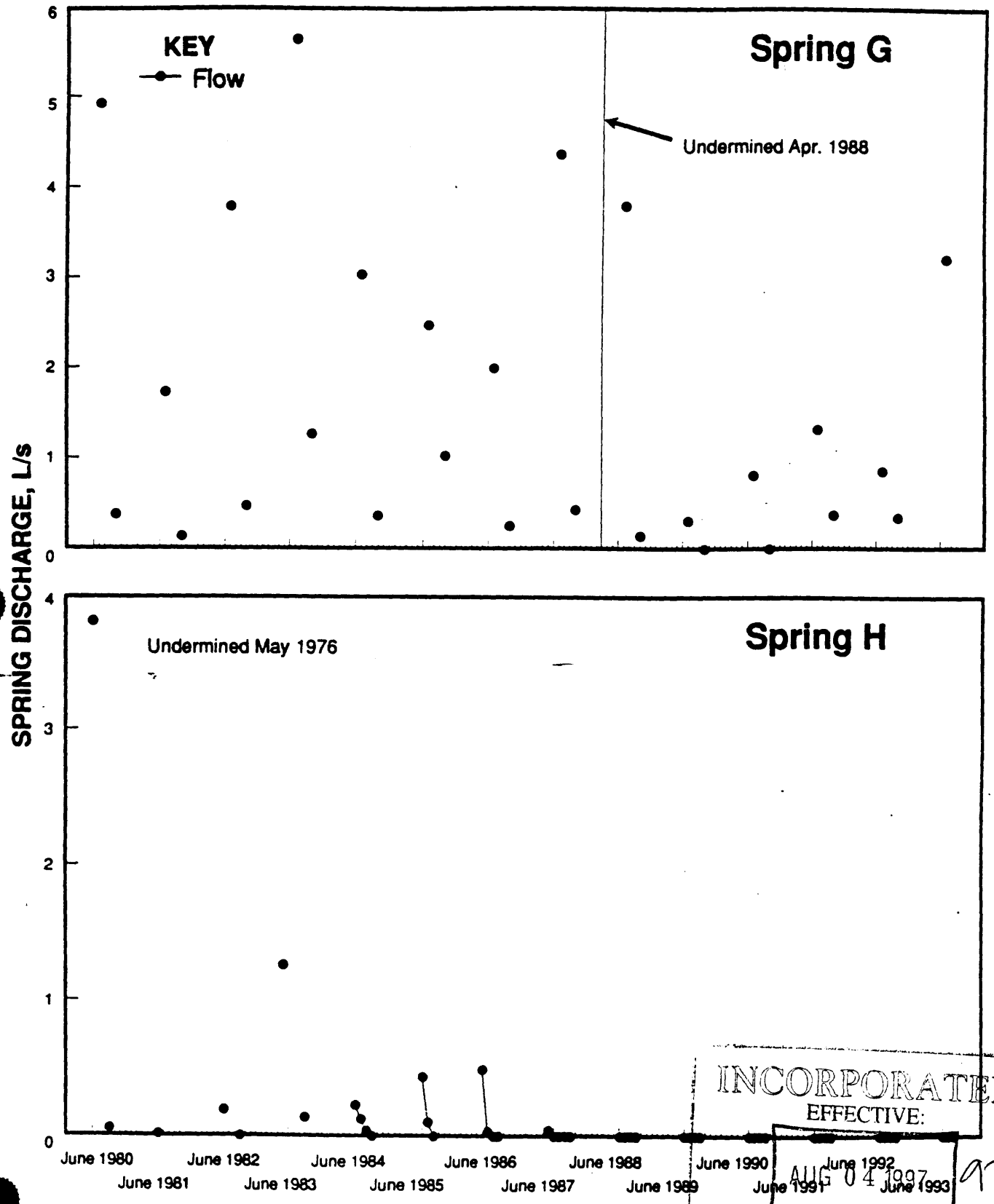


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

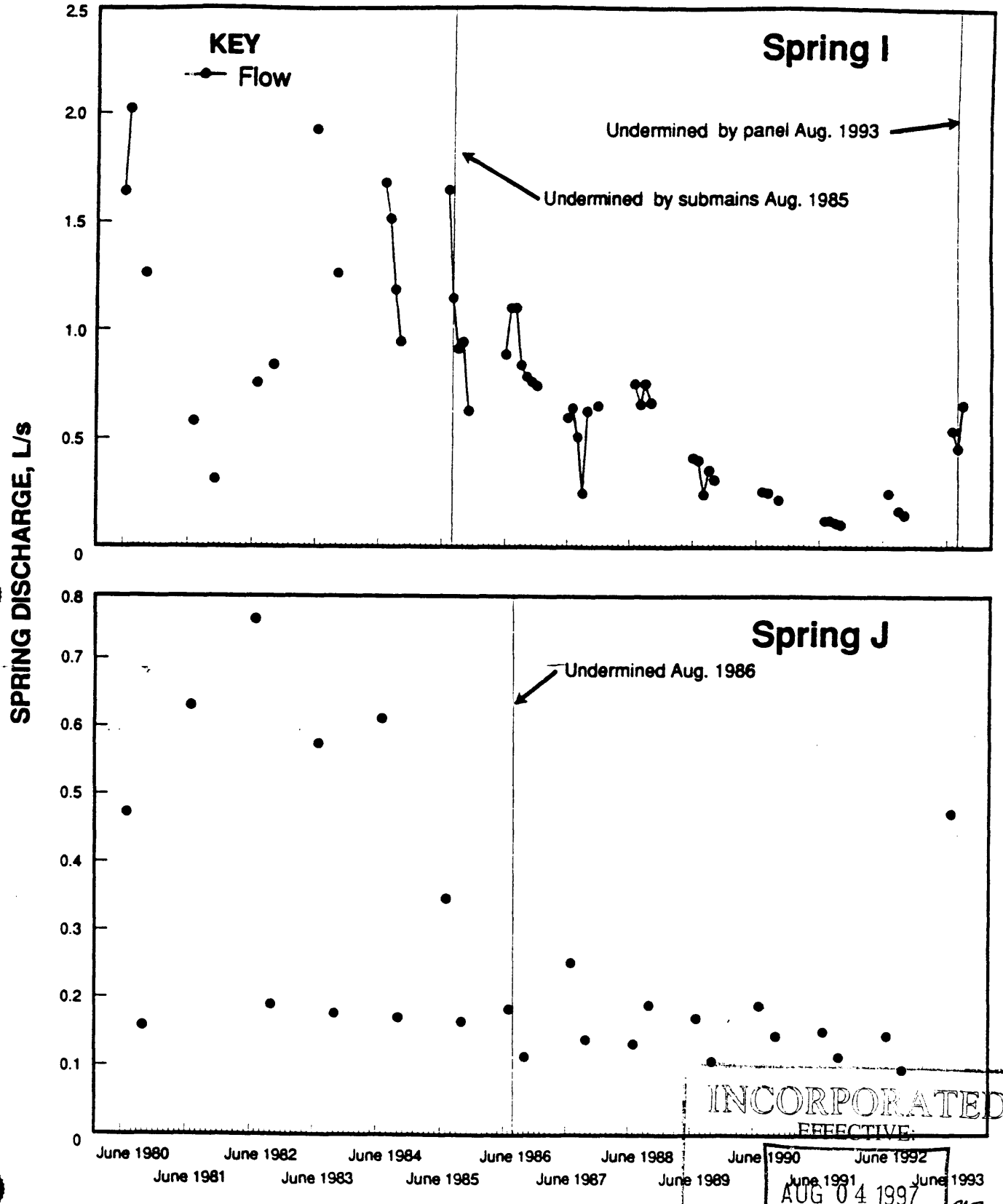


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 04 1997
UTAH DIVISION OIL, GAS AND MINING

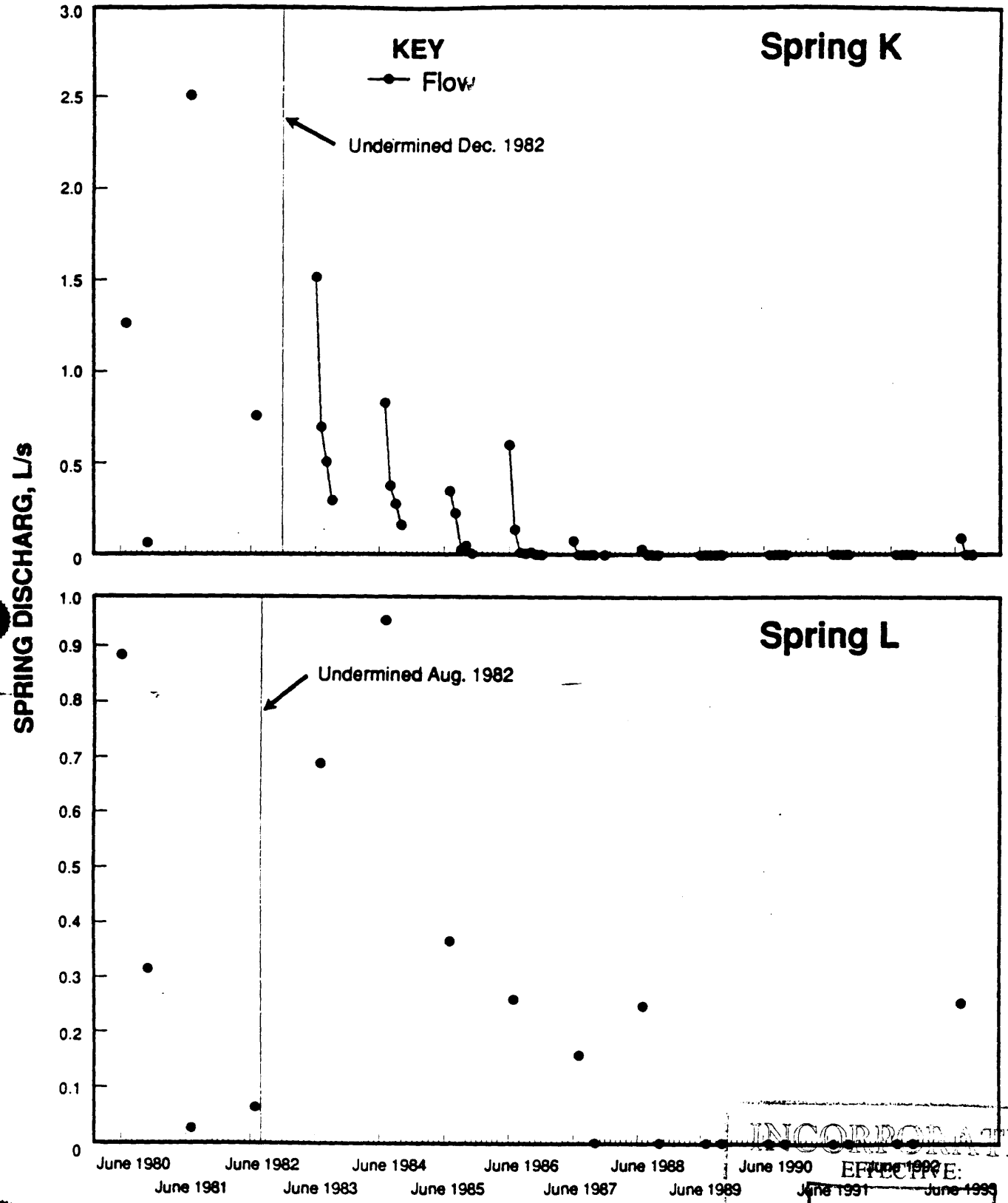


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

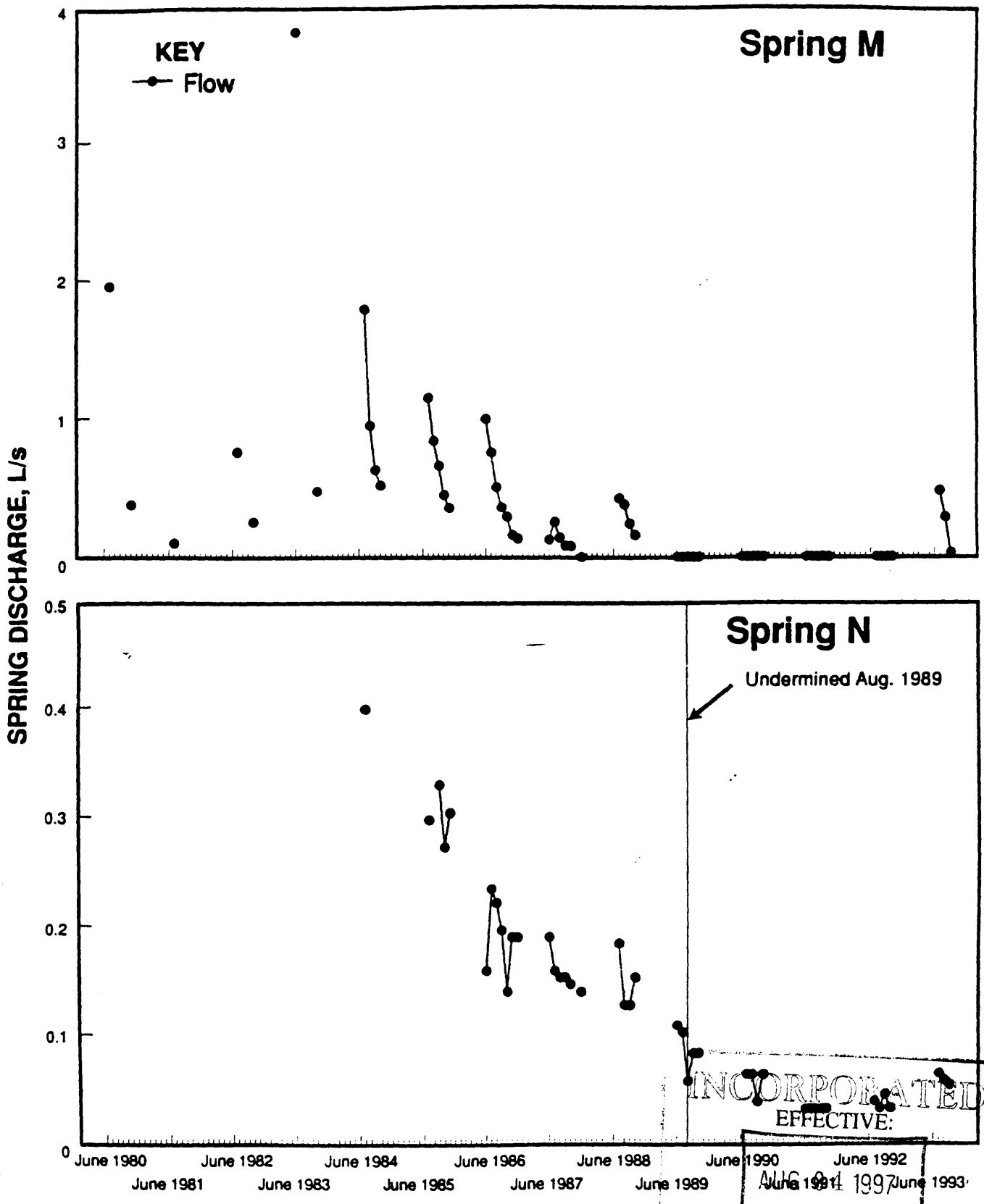
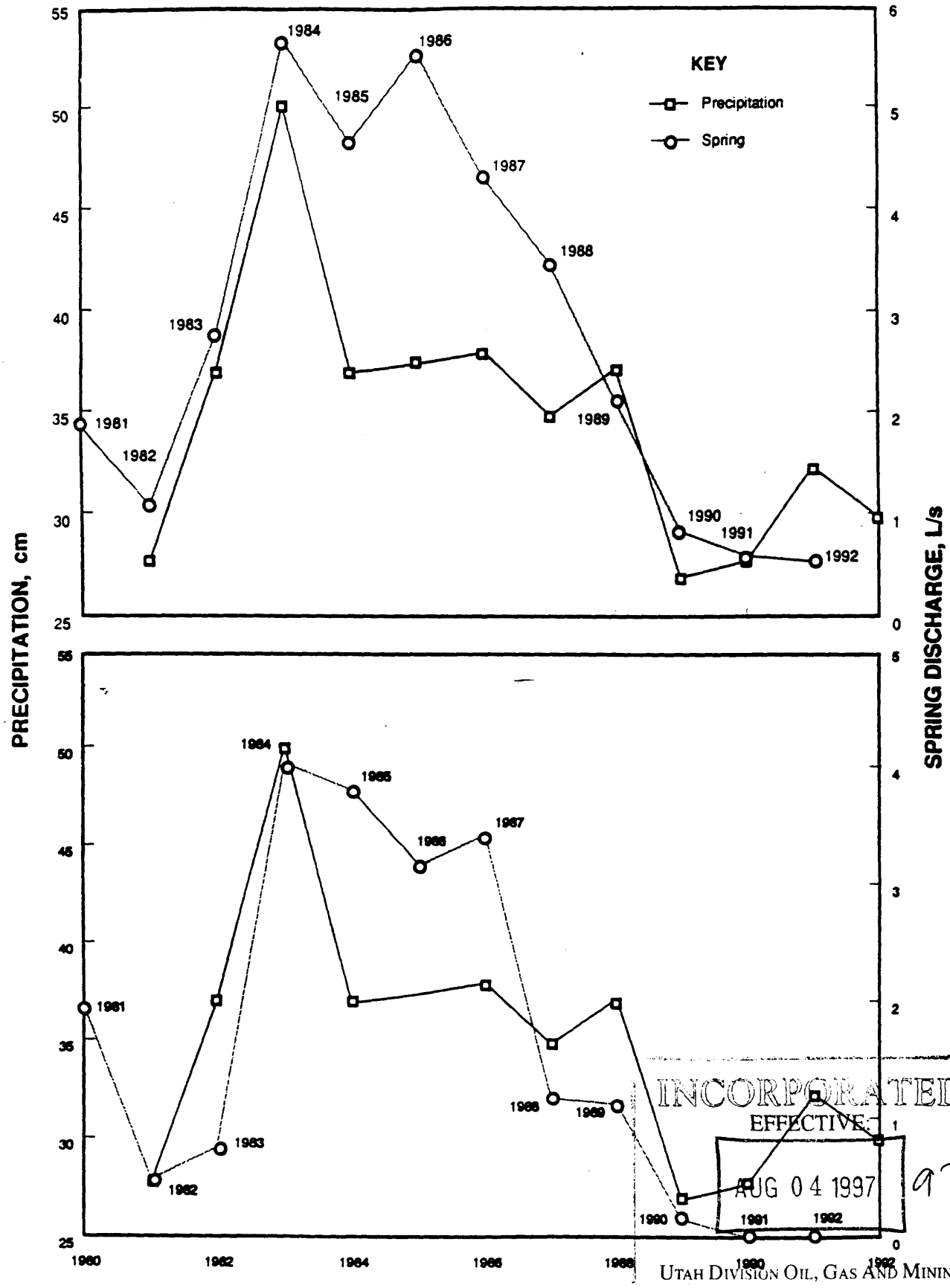


Figure A-2.—Continued.

INCORPORATED
EFFECTIVE:
AUG 01 1997
97-1
UTAH DIVISION OIL, GAS AND MINING



INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
UTAH DIVISION OIL, GAS AND MINING

Figure A-3.—Cross-correlated spring and precipitation data. Top, spring I; bottom, spring M.

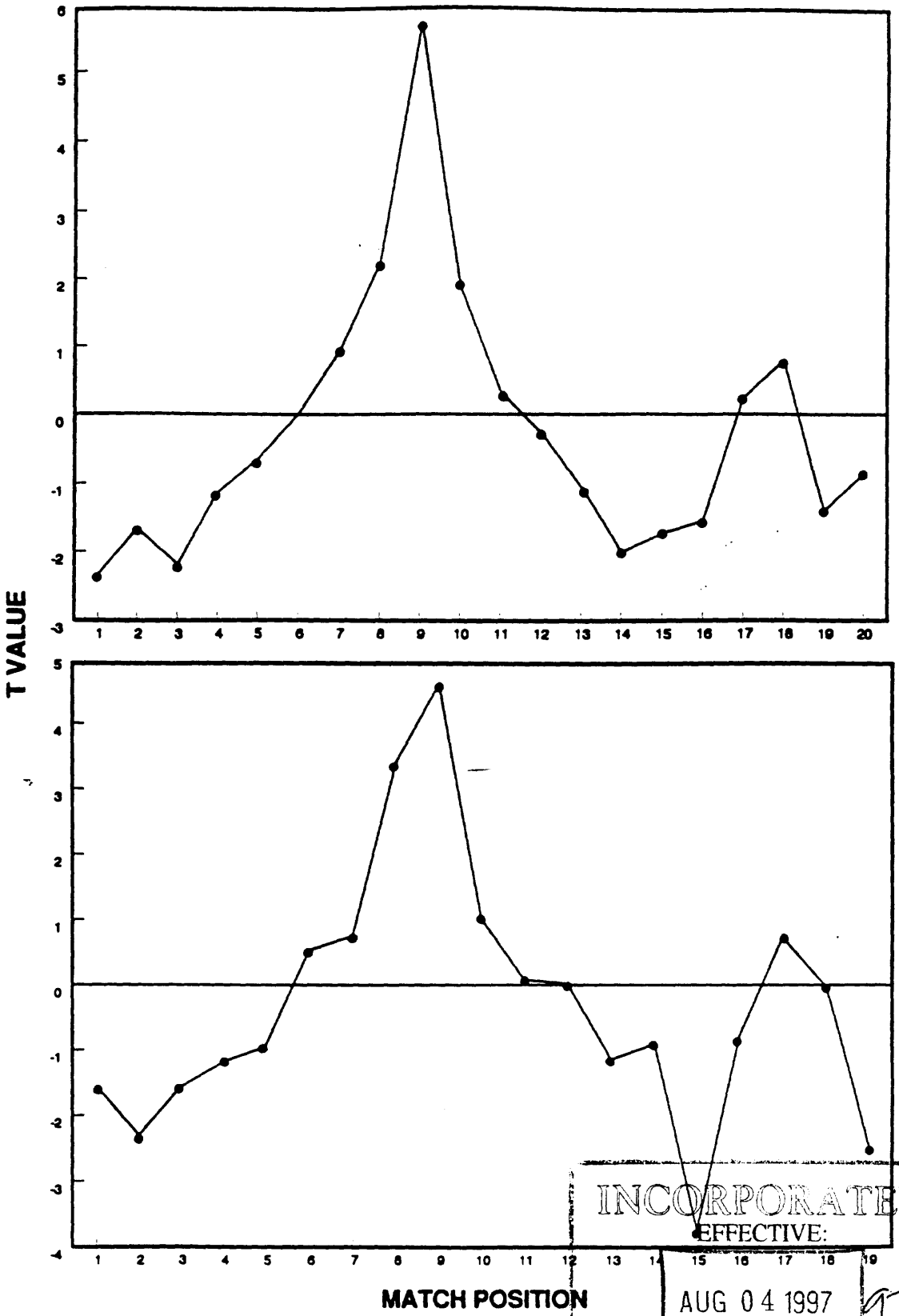


Figure A-4.—Match position versus T value. Top, spring I; bottom, spring M.

INCORPORATED
EFFECTIVE:
AUG 04 1997
97-1
INT.BU.OF MINES,PGH.,PA 29979
UTAH DIVISION OIL, GAS AND MINING

R645-301-700 HYDROLOGY SECTION

APPENDIX B

♦DRAINAGE AND SEDIMENT CONTROL PLAN

R645-301-700 HYDROLOGY SECTION

APPENDIX B

Based on the findings of the geotechnical evaluation and final surface facility design, PacifiCorp will develop a comprehensive drainage and sediment control plan for the North Rilda Canyon Portal Facilities. The drainage and sediment control plan will be developed in cooperation with the Division and the surface management agency. The Drainage and Sediment Control Plan will be included as Appendix B when available.

R645-301-800 BONDING SECTION

Based on the findings of the geotechnical evaluation and final surface facility design, PacifiCorp will develop a reclamation bond utilizing the format for the recently approved Deer Creek Mine surface facilities. The bond will be developed in cooperation with the Division and be included in the Bonding Section.