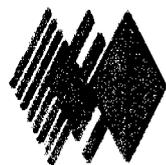


DEER CREEK COAL MINE
PERMIT APPLICATION
RILDA CANYON LEASE TRACTS



PACIFICORP

ELECTRIC OPERATIONS

CULTURAL AND HISTORIC RESOURCE INFORMATION R614-301-411.140

An intensive investigation for the Rilda Lease Tract area was conducted by Archaeological-Environmental Research Corporation in August, 1990. The information resulting from this investigation will be provided upon receipt of the final report. (Please refer to the following page.)

rlh



ARCHEOLOGICAL - ENVIRONMENTAL RESEARCH CORPORATION

P.O. Box 853 Bountiful, Utah 84010
Tel: (801) 292-7061, 292-9668

October 9, 1990

Utah Power & Light Company
Attn.: Mr. Val Payne
P.O. Box 310
Huntington, Utah 84528

Ref.: AERC letter of 8-7-90 submitting a cost proposal to UPL to
conduct intensive investigations on East Mountain

Dear Mr. Payne:

AERC has concluded the archaeological evaluations of 2280
acres on East Mountain. The archaeological report is presently
in preparation and should be available on or before November 1,
1990.

Three cultural resource sites were identified and recorded
during the survey (42EM 2222, 2223, and 2224). Site 42EM 2223 is
considered to be a significant resource and has potential for
nomination to the National Record of Historic Places. The other
two sites lack cultural depth, diagnostics, or features and have
marginal research potential. None of the three sites have
standing structures or sub-surface features which are susceptible
to impact caused by sub-surface subsidence.

Should you have any questions, please contact this office.

Sincerely,

F. Richard Hauck, Ph.D.
President

old
2-2

in the smallest size class. The species diversity index is 1.87. The soils of the Riparian reference site are a complex of a fine loamy Cumulic Haploboroll and a loamy skeletal Cumulic Haplogoroll.

Wildlife and Livestock

The mining permit area is located within the Ferron and Price Ranger Districts of the Manti-LaSal National Forest managed by the United States Forest Service. Both wildlife and livestock utilize the permit area for grazing. However, wildlife and livestock grazing is limited to the higher elevations. Very little wildlife and livestock grazing occurs on the steep slopes where the mine is located.

Deer, elk and moose utilize the area for grazing (Table 22). Deer have a greater impact on the vegetation than elk or moose because of their high numbers.

Besides wildlife use, the area provides summer grazing for cattle (Table 23). Cattle grazing occurs on the East Mountain allotment of the Ferron Ranger District. For the past several years, there has been a 10 percent non-use of the available AUM's. In 1980, all AUM's were utilized. Overall range condition was fair.

Endangered or Threatened Plants

During the vegetation sampling, no endangered or threatened plant species were identified.

Not updated

slopes

Rock Outcrop is dominantly from sandstone and shale. The boulders in the Rubble Land are from sandstone (75%).

Ustorthents soils are shallow and formed in material derived from sandstone. Permeability is moderately rapid in the soil material above the rock (25%).

Taxonomic classification is loamy-skeletal, mixed, mesic, Lithic Ustorthents. Pedon description follows:

A0-4 inches; pale brown (10YR 6/3) very gravelly loam; olive brown (2.5 Y 5/4) when moist; weak, fine granular structure; friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; common fine and few medium pores; 55% gravel; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); abrupt wavy boundary.

C1--4-14 inches; light gray (2.5 Y 7/2) extremely flaggy, fine sandy loam, light yellowish brown (2.5 Y 6/4) when moist; massive; very friable; few fine, medium and coarse roots; 40% flagstones; 30% channers; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

R--14 inches; sandstone.

Included in mapping are areas of material which have sloughed and been deposited by gravity in small areas (less than 100 sq. ft.). The soil material is deeper than Ustorthent soils. These areas are of such limited extent that they are of no consequence as a

EMERY COUNTY ZONING

- A-1 Agricultural Zone, contains the primary farming areas of the county.
- RA-1 Residential-Agricultural Zone, this is the area with the communities and the adjacent of intermixed agricultural lands.
- M&G-1 Mining and Grazing Zone, all of the country lands outside the communities, farming area and forest service boundary.
- I-1 Industrial Zone, specific areas near communities and highways reserved for industrial development.
- Ce-1 Critical Environmental Zone, general designation for all private land within the forest boundary.
- Ce-2 Critical Environemtnal Zone, specific designation for certain land parcels especially those adjacent to recreation sites in the forest.

PRIME FARMLAND INVESTIGATION R614-301-221

A prime farmland investigation has been requested from the Soil Conservation Service. When the information is received, it will be submitted. It is expected that the results will be similar to those regarding adjacent areas as discussed in the following information.

After investigating all the lands within the permit boundaries of the Deer Creek Coal Mine it is determined that these lands do not qualify as "Prime Farmlands" for the following reasons:

1. Historically the lands prior to construction were not used as crop land.
2. The slopes of and surrounding the protal area exceed 10 percent.
3. There is no developed water supply qualifying as an irrigation source.

Following is a negative determination from the US Soil Conservation Service.

**PERMIT APPLICATION PACKAGE
FOR THE
RILDA CANYON LEASE TRACTS
DEER CREEK MINE - ACT/015/018**

PERMIT APPLICATION PACKAGE
FOR THE
RILDA CANYON LEASE TRACTS
DEER CREEK MINE ACT/015/018

RECEIVED
OCT 16 1990

OIL, GAS & MINING

TABLE OF CONTENTS

	<u>PAGE</u>
Part 1 - Legal	
Right of Entry	1-1
Identification of Interests	1-3
Newspaper Advertisement	1-11
Part 2 - Environmental Resources	
Cultural and Historic Resource Information	2-1
Geology (Volume 8 - Deer Creek Mine PAP)	Volume 2
Hydrology (Volume 9 - Deer Creek Mine PAP)	Volume 3
Vegetation Information	2-3
Soils Information	2-42
Fish and Wildlife Resource Information	2-64
Land Use Information	2-93
Prime Farmland Investigation	2-96
Part 3 - Operation Plan	
Mine Operation	3-1
Mining Plan	3-3
Subsidence Control Plan	3-20

PERMIT APPLICATION PACKAGE
 FOR THE
 RILDA CANYON LEASE TRACTS
 DEER CREEK MINE ACT/015/018

MAPS

<u>VOLUME</u>	<u>MAP #</u>	<u>REFERENCE #</u>	<u>TITLE</u>
1	1-1	CM-10522-DR	Coal Ownership Map
1	1-2	CM-10521-DR	Surface Ownership Map
1	1-3	CM-10367-DR	Permit Area Map
1	2-14	CE-10488-DR	Vegetation of the Deer Creek Mine Permit Area
1	2-16	CE-10498-DR	General Soil Map of the Deer Creek Mine Permit Area
1	2-18A	CM-10595-DR	Land Use Map
1	2-18B	CM-10588-DR	Raptor Nesting Location & Habitat Map
1	2-19	CM-10543-DR	Mule Deer Habitat
1	3-1	CM-10473-DR 1 of 3	Five Year Mining Plan Blind Canyon Coal Seam
1	3-2	CM-10856-DR 2 of 3	Five Year Mine Plan Blind Canyon Coal Seam Rilda Lease Tract Extension Area
1	3-3	CM-10856-DR 3 of 3	Five Year Mine Plan Blind Canyon Coal Seam Rilda Lease Tract Extension Area
1	3-6	CM-10857-DR	Life of Mine Plan/5 Year Increments Blind Canyon Coal Seam Rilda Lease Tract Extension Area
1	3-7	CM-10858-DR	Life of Mine Plan/5 Year Increments Hiawatha Coal Seam Rilda Lease Tract Extension Area
2	2-1	CE-1042-EM	Surface Exploration Drill Holes

<u>VOLUME</u>	<u>MAP #</u>	<u>REFERENCE #</u>	<u>TITLE</u>
2	2-2	CE-10694-EM	Hiawatha Structure Contour Map
2	2-2A	CE-10693-EM	Blind Canyon & Cottonwood Structure Contour Map
2	2-3	CE-10244-EM	Geologic Cross-Sections
2	2-3A	CE-10769-EM	Joint Mapping Castlegate Sandstone South Lease
2	2-3B	CE-10790-EM	Joint Mapping Castlegate Sandstone Rilda Canyon
2	2-4	CE-10695-EM	Hiawatha Coal Seam Isopach
2	2-5	CE-10691-EM	Blind Canyon-Hiawatha Overburden Isopach
2	2-6	CE-10696-EM	Blind Canyon-Cottonwood Coal Seam Isopachs
2	2-6A	CE-10692-EM	Hiawatha-Cottonwood & Cottonwood- Blind Canyon
2	2-6B	CE-10703-EM	Hiawatha Coal Seam Overburden Isopach
2	2-6C	CE-10704-EM	Blind Canyon & Cottonwood Coal Seams-Overburden Isopach
3	HM-1	CE-10801-EM	Hydrology Data Map
3	HM-2	CE-10533-DR	Blind Canyon & Cottonwood In-Mine Water Monitoring Locations
3	HM-3	CE-10532-WB	Hiawatha Coal Seam In-Mine Water Monitoring Locations
3	HM-4	-	Roans Canyon Fault Crossing Hydrology
3	HM-5	CE-10404-EM	Spring Map

DEER CREEK MINE

ACT/015/018

PERMIT EXTENSION

RILDA CANYON LEASE TRACT

The Mine Permit Extension Area includes one (1) State of Utah Coal Lease (ML-22509), three (3) complete Federal Coal Leases (U-7653, U-47977 and SL-050862) and the southern 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 28	W1/2SW1/4	80 Acres
Section 29	S1/2	320 Acres
Section 30	SE1/4	160 Acres
Section 31	All	411.6 Acres
Section 32	All	640 Acres
Section 33	W1/2NW1/4, NW1/4SW1/4	120 Acres

Township 16 South, Range 6 East, SLM, Utah

Section 36	All	640 Acres
------------	-----	-----------

All together containing 2,371.6 Acres, more or less.

Right of Entry and Operations Information R614-400-110

The following is an itemized listing of State and Federal Coal leases, which the applicant bases his right to perform coal mining in the permit extension area. All leases have been subleased or assigned to Utah Power & Light Company:

- Lease No. SL-050862 (consolidated to include U-24069 and U-24070)

Issued to J.B. Johnson August 5, 1937
BLM approved assignment to UP&L - effective date July 1, 1986.

Section 28	W1/2 SW1/4
Section 29	E1/2 SE1/4
Section 33	W1/2 NW1/4, NW1/4 SW1/4

Township 16 South, Range 7 East, SLM, Utah
containing 280 acres

- Lease No. U-7653

Issued to Carroll County Coal Company September 1, 1970
BLM approved assignment to UP&L - effective date July 1, 1986.

Section 31	All
------------	-----

Township 16 South, Range 7 East, SLM, Utah
containing 411.6 acres

- Lease No. U-47977

Issued to West Appa Coal Company May 27, 1982
BLM approved assignment to UP&L - effective date
July 1, 1986

Section 32	All
------------	-----

Township 16 South, Range 7 East, SLM, Utah
containing 640 acres

- Lease No. U-06039

Issued to Ferdinand F. Hintze May 1, 1953
BLM approved assignment to UP&L - effective date
January 1, 1980

The portion of this Lease to be included in the extension
area is as follows:

Section 29	SW1/4, W1/2 SE1/4
Section 30	SE1/4

Township 16 South, Range 7 East, SLM, Utah
containing 400 acres

- Utah State Lease No. ML-22509

Issued to Malcolm McKinnon December 28, 1964
BLM approved assignment to UP&L - effective date
September 30, 1985

Section 36 All

Township 16 South, Range 6 East, SLM, Utah
containing 640 acres

Copies of the approved assignments of each Lease are enclosed to
verify right of entry.

There are no other owners of coal within the permit
extension area other than the United States and State of Utah.

Surface Owners of Record Within the Permit Extension Area

All surface lands within the permit extension area are
controlled by Federal and State Government agencies.

Section 36, Township 16 South, Range 6 East, SLM is a State
section which all 640 acres is controlled by:

The State of Utah
Division of State Lands and Forestry
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84180-1204

The remaining surface is controlled by:

The United States of America
Department of Agriculture
US Forest Service
Manti-LaSal National Forest
599 Price River Drive
Price, Utah 84501

Total acres of surface lands contained in the permit
extension area is approximately 2,371.6.

Identification of Interests R614-301-112

The following information identifies the owners of record of

all surface and subsurface areas contiguous to the permit extension area.

Owners of Surface Lands Contiguous to the Permit Area

Kent Barton
1515 Lavidia Drive
Disalia, California

Manti-LaSal National Forest
United States of America
Department of Agriculture
US Forest Service
599 Price River Drive
Price, Utah 84501

State of Utah
Division of State Lands & Forestry
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84180-1204

Owners of Subsurface Rights Contiguous to the Permit Area

Applicant is the current Leaseholder of record of the contiguous Federal leased coal on the north, east and south sides of the extension area. The area to the west is currently unleased Federal coal.

All federal coal in the State of Utah is administered by:

United States of America
Department of the Interior
Bureau of Land Management
Utah State Office
324 South State, Suite 301
Salt Lake City, Utah 84111-2303

There is one State Coal Lease (ML-23177) located in Section 2, T17S, R6E, SLM which is contiguous on the southwest of the extension area. This Lease is not controlled by the applicant. It is administered by:

State of Utah
Division of State Lands & Forestry
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84180-1204



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
 UTAH STATE OFFICE
 324 SOUTH STATE, SUITE 301
 SALT LAKE CITY, UTAH 84111-2303

3453
 SL-050862
 U-7653
 (U-942)

CERTIFIED MAIL
 RETURN RECEIPT REQUEST

JUN 20 1986

DECISION

Utah Power and Light Company	:	Coal
P.O. Box 899	:	SL-050862- U-24069- U-24070 and
Salt Lake City, UT 84110	:	U-7653

Assignment Approved
Assignment of Sublease Approved
Bonds Accepted

On September 3, 1985, an assignment of coal lease SL-050862-U-24069-U-024070 and an assignment of a sublease of U-7653, dated August 27, 1985, between Utah Power and Light Company, as assignee, and WA Land Company, as assignor, were filed in this office.

Satisfactory evidence of the qualifications and holdings of Utah Power and Light Company has been filed, and the lease accounts are in good standing. The assignments appear to meet the requirements of the regulations and are hereby approved effective July 1, 1986. Approval of these assignments does not constitute approval of any of the terms therein which may be in violation of the lease terms.

On June 13, 1986 two lease bonds were filed (Nos. 9291562 and 9291563) in the amounts of \$10,000 and \$5,000 covering coal leases U-7653 and SL-050862, respectively, with Utah Power and Light Company, as principal and American Casualty Company, as surety. These bonds have been examined, found to be satisfactory, and are accepted effective the date of filing.

ACTING *William D. Buzg*
 Chief, Minerals
 Adjudication Section



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
UTAH STATE OFFICE
324 SOUTH STATE, SUITE 301
SALT LAKE CITY, UTAH 84111-2303

IN REPLY REFER TO

3453
U-47977
(U-942)

*CE
DWT*

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JUN 17 1986
RECEIVED
JUN 18 1986
SYS. & RES. PLANNING

DECISION

Utah Power and Light Company
P.O. Box 899
Salt Lake City, UT 84110

: Coal Lease
: U-47977
:
:

Assignment Approved Bond Accepted

On September 3, 1985, an assignment of coal lease U-47977 dated August 17, 1985, between Utah Power and Light Company, as assignee, and W.A. Land Company, as assignor, was filed in this office.

Satisfactory evidence of the qualifications and holdings of Utah Power and Light Company has been filed, and the lease account is in good standing. The assignment appears to meet the requirements of the regulations and is hereby approved effective July 1, 1986. Approval of the assignment does not constitute approval of any of the terms therein which may be in violation of the lease terms.

As required by the regulations in 43 CFR 3472.2(a), a lease bond (No. 928 47 99) in the amount of \$1,048,200 covering coal lease U-47977, with Utah Power and Light Company, as principal, and American Casualty Company, as surety was filed in this office on June 10, 1986. The bond has been examined, found to be satisfactory and is accepted effective as of the date of filing.

[Handwritten Signature]
Chief Minerals
Adjudication Section

Utah State Office
University Club Building
100 East South Temple
Salt Lake City, Utah 84111

3453
SL-65122
at 21.
(U-342)

1979
DEC 1 3 1979

SL-65122
12/11

DECISION

Utah Power and Light Company
P. O. Box 899
Salt Lake City, Utah 84110

:
:
:
:
:

Coal Leases
Salt Lake 051221, Utah 06039
Utah 014275, Utah 024317,
and Utah 024319

Assignments of Coal Leases Approved
Bond Rider Accepted

On May 25, 1979, assignments of coal leases Salt Lake 051221, Utah 06039, Utah 014275, Utah 024317, and Utah 024319, entered into on May 18, 1979, between Utah Power and Light Company as assignee, and Peabody Coal Company as assignor, were filed in this office for approval.

Satisfactory evidence of the qualifications and holdings of Utah Power and Light Company is on file, and the lease accounts are in good standing. The assignments appear to meet the requirements of the regulations and are hereby approved effective January 1, 1980. Approval of the assignments does not constitute approval of any of the terms therein which may be in violation of the lease terms.

Utah Power and Light Company and its surety have also filed a rider to statewide coal bond, No. SL-6239407 which assumes the liability for the necessary reclamation required as a result of operations on the above-mentioned coal leases. The rider is satisfactory and is hereby accepted effective December 10, 1979.

/S/ L. POLLOCK

Chief, Minerals Section

Enclosures
Assignments

cc: Area Mining Supervisor (2)
Accounts

SSradley:al:12/11/79



STATE OF UTAH
NATURAL RESOURCES
State Lands & Forestry

Scott M. McInneson, Governor
Temple A. Reynolds, Executive Director
Ralph A. Miles, Division Director

State Office Building • Salt Lake City, UT 84114 • 801-533-5381

November 12, 1985

RECEIVED
NOV 1 1985

Utah Power and Light Company
1407 West North Temple
Salt Lake City, UT
84110

MINING AND
EXPLORATION

Gentlemen:

RE: ML 22509

The Director, on September 30, 1985, approved the assignment of the above-numbered lease to you by WA Land Company, who reserves 2 percent overriding royalty, in addition to 2 percent overriding royalty previously reserved.

The State assumes no responsibility in collecting or distributing overriding royalty.

Our records have been noted, and we herewith enclose the original lease and assignment.

Yours very truly,

DONALD G. PRINCE
ASSISTANT DIRECTOR

bp

Enclosures

STATE OF UTAH)
) ss.
COUNTY OF SALT LAKE)

On the 27th day of August, 1985, personally appeared before me Richard T. Conroy, the signer of the foregoing Assignment, who being by me duly sworn, did say that he is the President of WA LAND COMPANY and that the foregoing Assignment was signed on behalf of said corporation by authority of its bylaws or a resolution of its board of directors, and said Richard T. Conroy acknowledged to me that said corporation executed the same.

James W. Christensen
NOTARY PUBLIC, residing in
Salt Lake County, Utah

My commission expires:

9-30-89.

NEWSPAPER ADVERTISEMENT AND PROOF OF PUBLICATION R614-300-121

The following is a copy of the newspaper advertisement which will be published in a local newspaper of general circulation in the locality of the permit area at least once a week for four consecutive weeks. Proof of Publication will be filed with the Division within four weeks after the date of publication.

NOTICE

PacifiCorp, an Oregon Corporation (successor to Utah Power & Light Company), 324 South State, PO Box 26128, Salt Lake City, Utah 84126-0128, hereby announces its intent to file an application for an amendment of a Coal Mining Permit for the Deer Creek Coal Mine with the Division of Oil, Gas and Mining under the laws of the State of Utah and the Office of Surface Mining.

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 State of Utah, Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203. Said comments must be submitted with thirty (30) days from _____, 1990, 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 one (1) State of Utah Coal Lease (ML-22509), three (3) complete Federal Coal Leases (U-

7653, U-47977 and SL-050862) and the southern portion of Federal Coal Lease U-06039.

The extension area is more particularly described as follows:

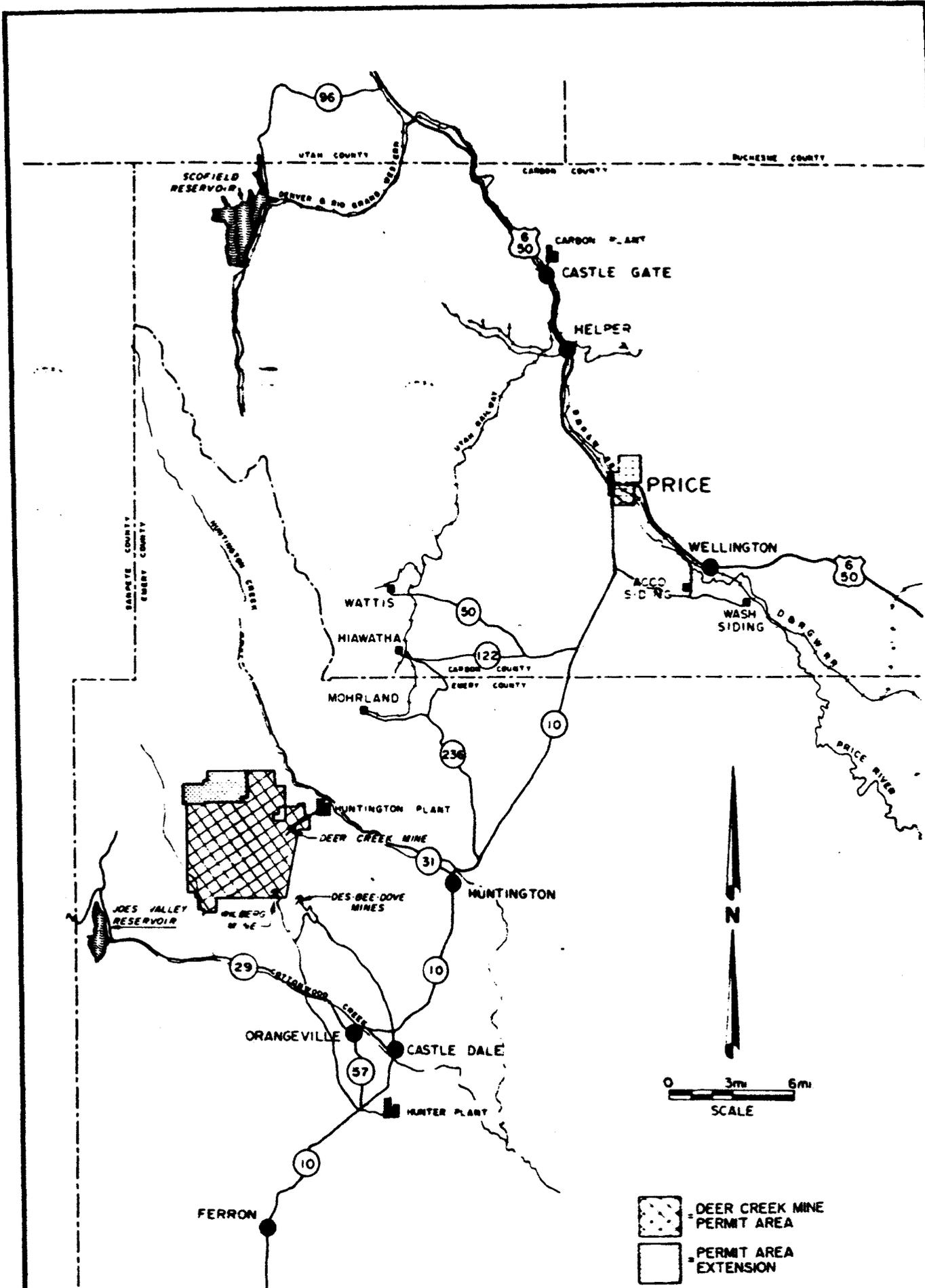
Township 16 South, Range 7 East, SLM, Utah

Section 28	W1/2SW1/4	80 Acres
Section 29	S1/2	320 Acres
Section 30	SE1/4	160 Acres
Section 31	All	411.6 Acres
Section 32	All	640 Acres
Section 33	W1/2NW1/4, NW1/4SW1/4	120 Acres

Township 16 South, Range 6 East, SLM, Utah

Section 36	All	640 Acres
------------	-----	-----------

All together containing 2,371.6 Acres, more or less.



-  DEER CREEK MINE PERMIT AREA
-  PERMIT AREA EXTENSION

CULTURAL AND HISTORIC RESOURCE INFORMATION R614-301-411.140

An intensive investigation for the Rilda Lease Tract area was conducted by Archaeological-Environmental Research Corporation in August, 1990. The information resulting from this investigation is contained in the report entitled Archeological Studies on East Mountain: A Prehistoric Highland-Lowland Occupation Hypothesis. Relevant portions of this report are included in the following pages.

The current mine plan (see Drawings CM-10857-DR and CM-10858-DR, Packets 3-6 and 3-7) does not involve mining beneath prehistoric site 42EM2223 which is identified as having National Register quality significance. The nearest area of longwall extraction is approximately 2800 feet from the site. Calculations for both 15 and 30 degree angles-of-draw indicated the site is well beyond the area of possible subsidence-related surface impacts.

ARCHEOLOGICAL STUDIES ON EAST MOUNTAIN:
A PREHISTORIC HIGHLAND-LOWLAND OCCUPATION HYPOTHESIS

Report Prepared for
UTAH POWER & LIGHT COMPANY
Federal Coal Lease - Deer Creek M&RP Modification

Utah State Project No. Ut-90-AF-363f
USDA-Forest Service Special Use Permit 8/15/90

AERC Project 1242 (UPL-90-2)

V. Garth Norman



PAPER NO. 46
of the
ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH
CORPORATION (AERC)

181 North 200 West, Suite 5
Bountiful, Utah 84010

October 1990

ABSTRACT

The East Mountain cultural resources survey project was commissioned by Utah Power and Light Company in July 1990, in conjunction with their Federal Coal lease, Deer Creek M&RP modification program. The project area covers a 2280-acre tract in the East Mountain locality between Rilda Canyon and Mill Canyon, Emery County, Utah, on Manti-La Sal National Forest land.

An intensive field survey conducted in August-September 1990, resulted in identifying and recording three prehistoric sites (42Em2222, 42Em2223, 42Em2224) and nine isolated artifacts. Of the three sites 42Em2223 has National Register quality significance. None of the three sites is considered susceptible to extensive damage through subsidence because of their low profile, lack of architecture, and lack of rock art. AERC accordingly recommends that a cultural resources clearance be granted to Utah Power and Light Company for this project.

Due to the extent of this and earlier surveys, this report assesses the significance of the sites in an East Mountain regional context that results in a highland-lowland connection hypothesis through drainages. Also, a regional site location predictive model has emerged demonstrating a high correlation between site locations and drainage heads in the upper elevations.

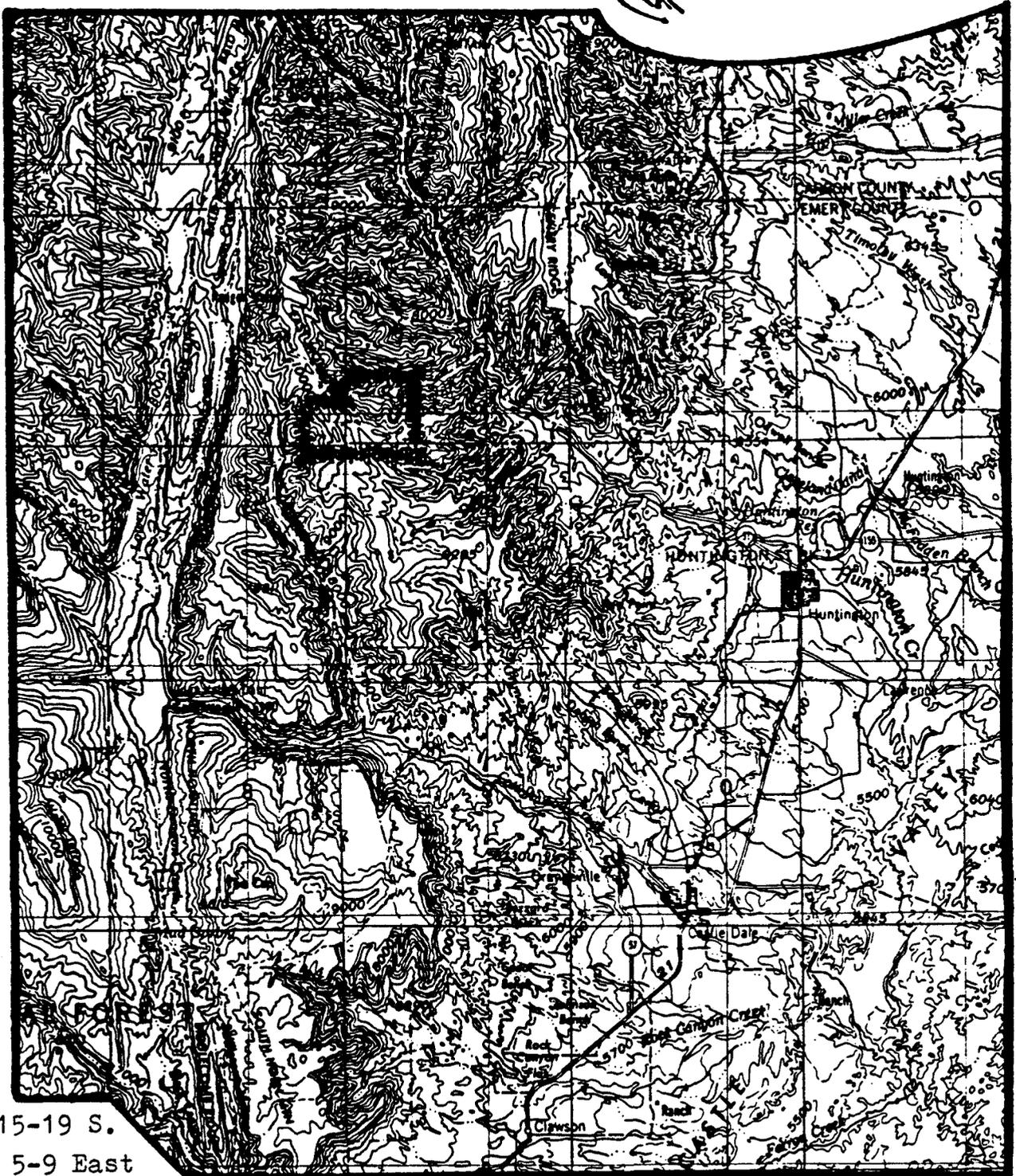
INTRODUCTION

During August and September, 1990, the Archeological-Environmental Research Corporation (AERC) of Bountiful, Utah, conducted an intensive cultural resource evaluation for Utah Power and Light Company (UPL) on East Mountain in Emery County, Utah (see Map 1). The survey was conducted under State authorization U90-AF-363f, and U.S. Forest Service special use permit dated 8/15/90, issued by the Price District Office of the Manti-La Sal National Forest.

UPL requested that an intensive cultural resource evaluation be conducted of a 2280-acre coal lease tract which is a potential subsidence zone. This project was initiated to comply with pertinent government legislation, i.e., Executive Order 11593 "Protection and Enhancement of Cultural Environment" (Federal Register, Vol. 36, No. 95, May 15, 1971), and "The Archeological and Historical Data Conservation Act of 1974." which is an amendment of "The Reservoir Salvage Act of 1960: (74 Stat. 220). Additional information on UPL's development may be obtained from their mine plan application. The East Mountain cultural resources survey project was commissioned in July 1990, in conjunction with the UPL Federal Coal lease, Deer Creek M&RP modification program.

The project is on Manti-La Sal National Forest land in the East Mountain locality of Emery County, Utah (Figure 1). The project survey tract extends from Rilda Canyon on the north, across the top of East Mountain to the heads of Meetinghouse Canyon and Mill Canyon on the south. The survey tract extends three miles east-west and one-and-a-half miles north-south. The legal description of the survey area is as follows:

Township 16 South, Range 6 East, Section 36;
Township 16 South, Range 7 East, Sections 31 & 32;
" " " " " " Section 28, west half of SW 1/4;
" " " " " " Section 29, south half;
" " " " " " Section 30, most of south half;
" " " " " " Section 33, west half of N 1/4,
NW 1/4 of SW 1/4.



T. 15-19 S.

R. 5-9 East

Meridian: Salt Lake B. & M.

Quad:

Price, Utah

Project: UPL-90-2

Series: Central Ut.

Date: 10-29-90

Figure 1

East Mountain Region and
Survey Project Locality

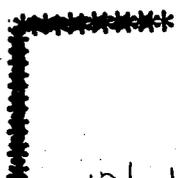
Legend:

Project
Locality

2-2.3



1:250,000



12/91

R614-301-321

VEGETATION INFORMATION FOR THE DEER CREEK MINE

REPORT PREPARED FOR
UTAH POWER & LIGHT COMPANY

BY

JERRY R. BARKER, PH.D.

RANGE ECOLOGIST

BIO-RESOURCES, INC.

PO BOX 3447

LOGAN, UTAH 84321

JULY 1982

Deer Creek Coal Mine is situated in a narrow canyon. Most of the working, or flat areas, were constructed from soil material excavated from the south canyon wall approximately 1970.

Removal of these materials have left open terraces which comprise an area of approximately 10 acres. Of the six terraces one, the lowest in elevation, is used for mining. The ROM conveyor belt line is located along this cut bench.

This north-facing slope is a mixed conifer vegetational community with open areas of sage brush.

Applicant states that the disturbance was constructed prior to SMACRA (Public Law 95-87), whose effective date was August 3, 1977 and that excluding the 4.0 acres associated with mining the remaining 6.0 acres are not included in the reclamation plan.

Tables in this report refer to the total 10 acres for reference only.

VEGETATION INFORMATION FOR THE DEER CREEK MINE

This reports the vegetation information for the Deer Creek Mining area. The Deer Creek Mine was existing at the time of vegetational sampling.

Methodology

Six vegetation types were identified within the permit area and adjacent areas and mapped (scale 1:24,000). Aerial photography (scale 1:24,000) and field reconnaissance were utilized to construct the vegetation map. Aerial photography (taken in 1962) and the vegetation of adjacent canyons and areas

were used to infer what species composition and aerial cover were before the present disturbance occurred at the Deer Creek mining site (see Map 2-14).

Reference sites to represent vegetation types disturbed by mining were located as close to the disturbed areas as feasible. Differences in species composition, total plant cover, aspect, soil and geology were minimized between the disturbed area and reference site. The reference sites were marked in the field with metal T-posts and located on the vegetation map (Maps 2-15). Pinyon-juniper, mixed-conifer and riparian were the vegetation types disturbed by mining activities.

Vegetation analyses of the reference sites consisted of developing a list of plant species by life form, measuring total plant cover, and determining shrub density and composition. Also, tree density by size class was determined.

Total plant cover was measured by the step-point method. Plant species cover, litter, rock or bare ground was determined every third pace along a 20 point transect. The starting point and direction of each transect was randomly selected.

The point-center quarter method was used to measure shrub density in all reference areas and tree density within the riparian vegetation type. At each sampling point two perpendicular lines were inscribed to delineate four quarters centered over the sampling point. The distance from the nearest plant in each quarter to the sampling point was measured and then

the shrub or tree was identified. Shrub and tree density was determined by the following equations:

$$A_j = (Y_1 + Y_2 + Y_3 + Y_4/4)^2$$

$$D = U(\sum A_j / N$$

where: Y_1 = distance from point nearest shrub in i th quarter,

A_j = mean area per sampling point,

N = sample size,

D = density, the number of shrubs per unit area,

U = unit area.

Five sampling points were placed 15 paces apart along a transect. The starting point and direction of each transect was randomly located.

Tree density was obtained in the pinyon-juniper and mixed-conifer reference areas by a complete enumeration by species. Tree size class was determined by measuring diameter at breast height (DBH) for all tree species except pinyon pine and Utah juniper which were measured at the base.

Statistical adequacy for sample size for aerial plant cover and woody plant density was determined by the following formula:

$$N_{min} = t^2 s^2 / (d\bar{x})^2$$

where: N_{min} = minimum sample size,

t = t-value for a 2-tailed test,

s = standard deviation,

d = allowable change in sample mean,

\bar{x} = sample mean.

Sample size for aerial cover was tested at the 90 percent confidence level ($t_{0.10,00} = 1.65$) with a 10 percent error of the mean ($d=0.10$). Plant density sample size was tested at the 80 percent confidence level ($t_{0.20,00} = 1.282$) with 10 percent error of the mean ($d=0.10$). Adequacy for aerial cover and density was calculated after 10 and 20 samples, respectively. Table 1 gives the minimum sample size and observed sample size for the reference areas. Data presented hereafter are based on the observed sample size.

Shrub composition based on density was determined by the following equations:

$$C = S_i / T$$

$$T = \sum S_i$$

where: S_i = total individuals of the i th species,
 T = total number of shrubs sampled,
 C = shrub composition.

Jaccard's Community Coefficient was used to quantify the similarity in plant species between the reference and disturbed area. The Coefficient is:

$$I.S. = (C/A+B-C) 100\%$$

where: I.S. = index of similarity
 A = total species in community a,
 B = total species in community b,
 C = number of species common to both.

The Shannon Index was used to calculate species diversity for the reference areas. The index is:

$$H' = \sum P_i \ln P_i$$

where: H' = species diversity index,

P_i = proportion of the observations found in category
i.

Diversity calculations are based on ground cover by species. The maximum possible diversity for a reference area is:

$$H'_{\max} = \ln K$$

where: H'_{\max} = maximum diversity,

K = the number of categories, i.e., species.

The ratio between H' and H'_{\max} is referred to as species evenness.

This is calculated as:

$$J = H' / H'_{\max}$$

where: J = species evenness

United States Forest Service and Utah Division of Wildlife Resources personnel located in Price, Utah were consulted on August 15 and 16, 1980 with regards to livestock and big game vegetational use within the permit area.

Personnel involved with vegetational sampling, data analysis, and report writing:

Jerry Barker
Bio-Resources, Inc.
PO Box 3447
Logan, Utah 84321

Marianne Barker
Bio-Resources, Inc.
PO Box 3447
Logan, Utah 84321

Mark Johnson
Emery Mining Corporation
PO Box 310
Huntington, Utah 84528

Personnel consulted in preparation of the information:

Alvin R. Southard
Department of Soils and Biometeorology
Utah State University
Logan, Utah 84321

Christian Shingelton
Utah Power & Light Company
PO Box 899
Salt Lake City, Utah 84110

Larry Dalton
Wildlife Biologist
Division of Wildlife Resources
Price, Utah 84501

Bob Graves
Range-Wildlife Specialist
United States Forest Service
Price, Utah 84501

Aerial plant cover and tree density measurements for the mixed-conifer, riparian, and pinyon-juniper reference areas were measured on August 12-15, 1980 and analyzed September 8 and 9, 1980. Shrub density data for the riparian and pinyon-juniper reference areas were collected on April 16, 1982 and analyzed April 21, 1982. Shrub density for the mixed-conifer reference area was measured June 17, 1982 with data analyzed June 22, 1982.

Permit Area Vegetation

The mine property permit area is 18,000 acres. Six major vegetation types were identified within the permit area and adjacent land (see 2-14, Vegetation Map). Mixed conifer, pinyon-juniper, sagebrush, grass, riparian and salt desert shrub are the six vegetation types (Table 2). The mixed-conifer type occurs primarily at the higher elevations (above 9,000 ft.) or at lower elevations with a northern exposure. The pinyon-juniper

vegetation type is found on the steep, rocky slopes with a southern exposure and the relatively flat ground at lower elevations (7,000 ft). At the higher elevations and on north-facing slopes, it is common for the pinyon-juniper community to inter-mix with the mixed-conifer community. Elevation for this vegetation type varies from 7,000 to 9,000 feet. The sagebrush and grass vegetation types also occur at the high elevations, but are restricted to the drier sites than the mixed conifer. The riparian vegetation type is located along Deer Creek, Cottonwood and Grimes Wash. This vegetation type is better developed along Deer Creek below the mine, than along Cottonwood and Grimes Wash. The salt-desert shrub vegetation type is found within the permit area, in the vicinity of the Des Bee Dove Sedimentation Pond and Haul Road. It has a generally southern exposure and ranges in elevation from 6,400 to 7,400 feet. Slopes vary from 5 to 60%. This vegetation community is generally associated with the rock land miscellaneous land types (SCS Soil Survey, Carbon-Emery Area, Utah 1970). Vegetation consists primarily of saltbush greasewood and salina wildrye.

Area Disturbed by Mining

Table 3 lists the vegetation types and acres disturbed by mining activities.

The disturbed area of the Deer Creek Mine totals about 20 acres. Elevation is approximately 7,500 feet. The general slopes varies around 33-36°. Average annual precipitation varies around 10 inches. The aspect of this area is mainly northern and

southern. The vegetation type occurring on the northern exposure is mixed-conifer. A pinyon-juniper vegetation type is found on the southern exposure.

The mixed-conifer vegetational type was dominated by white fir and Douglas fir (Table 4). Common plants were Saskatoon serviceberry, elderberry, mountain snowberry, corymbed eriogonum, Louisiana sage, bluebunch wheatgrass and salina wildrye. Total aerial cover varied around 47%. Soils were probably an Argiboroll-Cryoboroll complex. The disturbed area is 10 acres.

The pinyon-juniper vegetation type was characterized by Utah juniper and pinyon pine (Table 5). Saskatoon serviceberry, Mormon tea and low rabbitbrush were the common shrubs. Bluebunch wheatgrass, salina wildrye, Indian ricegrass and corymbed eriogonum were the dominant herbaceous plants. Total aerial cover varied from 37 to 40 percent. Soils were probably Ustorthents*. The disturbed area is 19.5 acres.

A third vegetation type disturbed by mining activities is the riparian area along Deer Creek. This is a intermittent stream that flows in a northeast direction. Dominant woody plants were narrowleaf cottonwood, white fir, Douglas fir, Rocky

(*Reclassified by Dr. A.R. Southard in 1989)

Mountain maple, redosier dogwood and Saskatoon serviceberry (Table 6). Aerial plant cover varied around 70%. Soils were probably a Haploboroll. The disturbed area is 1.5 acres.

Reference Sites

Three reference sites were established to represent the vegetational types disturbed by mining activities (Table 7, 8 and 9; Map 2-15).

The reference site for the mixed-conifer vegetation type has a northwestern exposure and is located at 7,800 feet elevation. Slope varies from 33-36°. Important plants include white fir, Douglas fir, Saskatoon serviceberry, elderberry, mountain snowberry, corymbed eriogonum, galium, hoary aster, bluebunch wheatgrass and salina wildrye (Table 10). Total aerial cover is 46% with the woody plants contributing the most cover (Table 11). Shrub density is 3,290 plants per acre (Table 12). Wild buckwheat has the greatest density while Rocky Mountain maple and myrtle pachistima are the least dense. There are 30 trees/acre in referenced area (Table 13). Douglas fir is the most common tree. Also, the majority of trees occur within the smallest size class. The species diversity index is 2.46. The soils belong to the Beenom-Comodore complex. The Beenom series is a loamy mixed Lithic Agriboroll, while the Comodore series is a loamy-skeletal Lithic Cryoboroll. The reference site is 5,155 m².

The reference site (5,422m²) for the pinyon-juniper vegetation has a southeastern exposure and is located at 7,800

feet elevation. Slope varies around 35°. Dominant plants include Utah juniper, pinyon pine, Saskatoon serviceberry, Mormon tea, corymbed eriogonum, bluebunch wheatgrass and salina wildrye (Table 14). Total aerial plant cover is 37% with trees and grasses providing most of the cover (Table 15). Shrub density is 554 plants per acre (Table 16). Cutler ephedra has the greatest density while mountain snowberry and curlleaf mountain mahogany are the least. Tree density is 30 plants per acre with Utah juniper being the most common (Table 17). The majority of trees occur within the largest size class. The species diversity index is 2.03. The soils are loamy-skeletal mixed mesic Lithic Ustorthents*.

The reference site (4,500') for the riparian vegetation type is located along Deer Creek with an elevation of 7,100 feet. This vegetation type is located on the steep banks of Deer Creek. Important plants include narrowleaf cottonwood, white fir, Douglas fir, redosier dogwood, Rocky Mountain maple and mountain snowberry (Table 18). Aerial plant cover is 73% with trees being the dominant life form (Table 19). Shrub density is 1,166 plants per acre (Table 20). Rocky Mountain maple has the greatest density while skunk bush is least. Tree density is 2,246 plants per acre (Table 21). Douglas fir has the greatest density while Rocky Mountain juniper is the least. The majority of trees occur

(*Reclassified by Dr. A.R. Southard in 1989)

in the smallest size class. The species diversity index is 1.87. The soils of the Riparian reference site are a complex of a fine loamy Cumulic Haploboroll and a loamy skeletal Cumulic Haplogoroll.

Wildlife and Livestock

The mining permit area is located within the Ferron and Price Ranger Districts of the Manti-LaSal National Forest managed by the United States Forest Service. Both wildlife and livestock utilize the permit area for grazing. Livestock grazing is generally limited to the higher elevations; however, wildlife species utilize the entire area.

Deer, elk and moose utilize the area for grazing (Table 22). Deer have a greater impact on the vegetation than elk or moose because of their high numbers.

Besides wildlife use, the area provides summer grazing for cattle (Table 23). Cattle grazing occurs on the East Mountain allotment of the Ferron Ranger District. For the past several years, there has been a 10 percent non-use of the available AUM's. In 1980, all AUM's were utilized. Overall range condition was fair.

Endangered or Threatened Plants

Six listed threatened or endangered plants occur in Emery County (Page 2-14.1), but no rare or T&E species are known from the immediate area (Welsh, et al, 1987). Most of the endangered plant species in Emery County occur in the San Rafael Swell (Welsh, et al 1987) in the eastern part of the county.

12/91

**THREATENED AND ENDANGERED PLANT SPECIES
OCCURRING IN EMERY COUNTY^{1,2}**

<u>PLANT</u>	<u>STATUS³</u>	<u>LOCATION</u>
<u>Cycladenia humilis</u> var. <u>jonesii</u>	T	San Rafael Swell. Eriogonum-ephedra, mixed desert shrub, juniper communities; 1340 to 1830 m; Cutler, Summerville, Chinle formations.
<u>Erigeron maguirei</u> var. <u>maguirei</u>	E	San Rafael Swell. Canyon bottoms; 1640 to 1740 m; Wingate (?) and Navajo formations.
<u>Townsendia aprica</u>	T	Salt desert shrub, pinyon-juniper communities; 1860 to 2440 m; Mancos Shale (Blue Gate Member).
<u>Echinocereus triglochidiatus</u> var. <u>inermis</u>	E	Blackbrush, ephedra, sagebrush, pinyon-juniper, mountain brush, aspen communities; 975 to 2562 m.
<u>Pediocactus despainii</u>	E	San Rafael Swell. Open pinyon-juniper community on limestone gravels; ca 1830 m.
<u>Sclerocactus wrightiae</u>	E	Salt desert shrub, shrub-grass to juniper communities; 1460 to 1865 m; Mancos Shale (Blue Gate, Tununk, Emery, Ferron Members), Dakota, Morrison, Summerville, Entrada formations.

1 - USDI, USFWS 1990

2 - Welsh, et al 1987

3 - T = Threatened

E = Endangered

Productivity*

The current range condition of the mine and reference areas is judged as fair when correlated with USFS' assessment of the East Allotments (Land Use Section). The opportunity for improvement is very limited because of the inherent characteristic of the pinyon-juniper overstory to inhibit understory development. Also these steep sites are limited by the lack of soil and numerous rock masses.

PINYON-JUNIPER PRODUCTIVITY¹

1. Soil Conservation Service, Soil Survey Carbon-Emery Area 1979

Kenilworth very stony sandy loam, Wood Hill Range Site, Price, excellent condition (understory intact) 900-1250 lbs/acre (dry weight).

2. US Forest Service, Ferron Ranger District John Healy, Range Conservationist
 - a. East Mountain Allotment, two pinyon-juniper bench sites rated in 1982 fair condition 150-160 lbs/acre (dry weight)
 - b. Two mixed conifer sites (Deer Creek drainage) rated in 1982, fair condition 167-290 lbs/acre (dry weight)
3. Bureau of Land Management, San Rafael Planning Unit Wilberg and West Huntington Allotments, fair condition Current stocking rates 60-100 lbs/acre (dry weight)²

¹ Fifty percent of the total forage production is the annual growth of the pinyon and juniper trees.

² Based on 800 lbs forage = 1 AUM.

* Reference area condition and productivity were reassessed in 1989 (see pages 2-149 & 2-150).

The productivity for the pinyon-juniper reference site on the steep slopes is estimated at 25-100 lbs/acre (dry weight). This is inferred from the data on the benches and comparisons of the sites.

Riparian Productivity

1. Soil Conservation Service, Soil Survey Carbon-Emery Area 1979

Wet stream bottom range site, Huntington Creek, mixed alluvial lands between stream bank and steep side hills. (1500-2500 lbs/acre (dry weight)).

The mixed conifer reference site is located in an area that is most representative of the disturbed area, i.e., 50% trees and 50% understory.

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

350 North 4th East
Price, Utah 84501

October 19, 1989

Mr. Val Payne
Utah Power & Light
P.O. Box 310
Huntington, Utah 84528

Dear Mr. Payne:

Here is the summary of the sites that Mr. Davis and I
visited. Below is the information that is needed.

Veg. Type Ecolog Cond. Present Prod. Potential Prod.

DES-BEE-DOVE MINE

Pinyon-Jun.	Fair	800	1,000
Saltbush	Fair	150	200

DEER CREEK MINE

Mixed Conifer	Good	2,000	2,500
Pinyon-Jun.	Good	800	900
Riparian	Fair	1,800	3,000

COTTONWOOD WILBERG

Pinyon-Jun. (Fan Portal)	Good	1,800	1,800
Pinyon-Jun. (Wasterock Storage)	Fair	700	1,200
Pinyon-Jun. (Wasterock Storage)	Fair	400	1,200
Pinyon-Jun. Black Sage (Wasterock Storage)	Good	600	900
Saltbush (Wasterock Storage)	Fair	250	500
Saltbush (Wasterock Storage)	Good	125	150

The production for the sites above are based on an average year.

George S. Cook

George S. Cook
Range Conservationist
Price, Utah

Table 1 Sample adequacy for aerial plant cover and shrub density (tree density for riparian) for the mixed-conifer, pinyon-juniper, and riparian reference areas at the Deer Creek Mine.

<u>Reference Site</u>	<u>Parameter</u>	<u>N_{min}</u> ¹	<u>\bar{X}</u>	<u>S.D.</u>	<u>N_{obs.}</u>
Mixed-conifer	Aerial cover	9	50.5	11.65	20
	Shrub density	21	1.29 ²	0.46	25
Pinyon-juniper	Aerial cover	9	33.0	7.25	20
	Shrub density	37	7.59 ²	3.11	45
Riparian	Aerial cover	7	68.50	13.55	18
	Shrub density	117	2.75 ²	2.32	40
	Tree density	15	1.81 ²	0.54	20

¹ Determined after 10 and 20 samples for aerial cover and density, respectively.

² Sample mean of mean area per plant (m²).

Table 2 Vegetation types and size of each that are found within the permit area and adjacent land.

<u>Vegetation Type</u>	<u>Total Acres</u>	<u>% of Permit Area</u>
Mixed Conifer	9,037.1	50.2
Pinyon-juniper	4,524.4	25.1
Sagebrush	4,053.0	22.5
Grass	301.5	1.7
Riparian	<u>84.0</u>	<u>0.5</u>
TOTAL	18,000.0	100.0

Salt Desert Shrub¹

¹ The salt desert type is located on land adjacent to the permit area. It is influenced by the Des Bee Dove Pond and Haul Road (see vegetational map).

Table 3 Vegetation types, number of acres and percent of vegetation type disturbed by mining at the Deer Creek Mine.

<u>Vegetation Type</u>	<u>Area Disturbed</u>	<u>% of Vegetation Type</u>
Pinyon-juniper	19.5	0.4
Mixed-conifer	10	0.1
Riparian	5	6.0

Table 4 Plant species that are inferred to have grown within the disturbed portion of the mixed-conifer vegetation type at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Abies concolor</u>	White fir
<u>Juniperus scopulorum</u>	Rocky Mountain juniper
<u>Pinus edulis</u>	Pinyon pine
<u>P. flexilis</u>	Limber pine
<u>Populus tremuloides</u>	Quaking aspen
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Artemisia tridentata</u>	Big sagebrush
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Berberis repens</u>	Creeping barberry
<u>Chrysothamnus nauseosus</u>	Rubber rabbitbrush
<u>C. viscidiflorus</u>	Low rabbitbrush
<u>Clematis</u> sp.	Virginsbower
<u>Eriogonum</u> sp.	Wild buckwheat
<u>Rhus trilobata</u>	Skunkbush
<u>Ribes aureum</u>	Golden current
<u>Sambucus cerulea</u>	Elderberry
<u>Symphoricarpos oreophilus</u>	Mountain snowberry
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Castilleja chromosa</u>	Indian paintbrush
<u>Eriogonum corymbosum</u>	Corymbed eriogonum
<u>Galium</u> sp.	Galium
<u>Heterotheca villosa</u>	Hairy goldaster
<u>Machaeranthera canescens</u>	Hoary aster
<u>Melilotus officinalis</u>	Yellow sweetclover
<u>Senecio multilobatus</u>	Lobeleaf groundsel
<u>Trifolium</u> sp.	Clover
<u>Grasses</u>	
<u>Agropyron spicatum</u>	Bluebunch wheatgrass
<u>Elymus salinus</u>	Salina wildrye
<u>Festuca</u> sp.	Fescue
<u>Poa pratensis</u>	Kentucky bluegrass

Table 5 Plant species that are assumed to have grown within the disturbed portion of the pinyon-juniper vegetation type at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Abies concolor</u>	White fir
<u>Juniperus scopulorum</u>	Rocky Mountain juniper
<u>Pinus edulis</u>	Pinyon pine
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Artemisia tridentata</u>	Big sagebrush
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Chrysothamnus viscidiflorus</u>	Low rabbitbrush
<u>C. nauseosus</u>	Rubber rabbitbrush
<u>Ephedra cutleri</u>	Morman tea
<u>Symphoricarpos oreophilus</u>	Mountain servicberry
<u>Xanthocephalum sarothrae</u>	Snakeweed
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Eriogonum corymbosum</u>	Corymbed eriogonum
<u>Cryptantha flavoculata</u>	Cryptantha
<u>Galium sp.</u>	Galium
<u>Hedysarum boreale</u>	Utah sweetvetch
<u>Machaeranthera canescens</u>	Hoary aster
<u>Petradoria pumila</u>	Rock goldenrod
<u>Grasses</u>	
<u>Agropyron spicatum</u>	Bluebunch wheatgrass
<u>Elymus salinus</u>	Salina wildrye
<u>Oryzopsis hymenoides</u>	Indian ricegrass

Table 6 Plant species that are assumed to have grown within the disturbed portion of the riparian vegetation type at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Abies concolor</u>	White fir
<u>Juniperus scopulorum</u>	Rocky Mountain juniper
<u>Populus angustifolia</u>	Narrowleaf cottonwood
<u>P. tremuloides</u>	Quaking aspen
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Acer glabrum</u>	Rocky Mountain maple
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Berberis repens</u>	Creeping barberry
<u>Cornus stolonifera</u>	Redosier dogwood
<u>Physocarpus sp.</u>	Ninebark
<u>Rhus trilobata</u>	Skunk bush
<u>Rosa woodsii</u>	Woods rose
<u>Salix exigua</u>	Coyote willow
<u>Symphoricarpos oreophilus</u>	Mountain servicberry
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Cirsium vulgare</u>	Bull thistle
<u>Ipomopsis aggregata</u>	Skyrocket gilia
<u>Machaeranthera canescens</u>	Hoary aster
<u>Melilotus officinalis</u>	Yellow sweetclover
<u>Trifolium sp.</u>	Clover
<u>Grasses</u>	
<u>Bromus tectorum</u>	Cheatgrass
<u>Festcua sp.</u>	Fescue
<u>Poa pratensis</u>	Kentucky bluegrass
<u>Stipa commata</u>	Needle-and-Thread grass

Table 7 Similarity between the mixed-conifer reference area and disturbed site at the Deer Creek Mine.

<u>Parameter</u>	<u>Reference</u>	<u>Disturbed</u>
Cover, %	46.5	44-48
Density, No/Acre		
Shrub	3,290	-
Tree	40	-
Species composition, s ¹	31	30
Aspect	Northwest	Northwest
Elevation, ft.	7,800	7,500-7,800
Slope, °	33-36	33-36
Soil	Argiboroll-Cryoboroll	Argiboroll-Cryoboroll
Geology	Colluvial	Colluvial
H'	2.46	-
H' _{max}	2.94	-
J	0.84	-
Index of similarity, %		72.2

¹ total plant species

Table 8 Similarity between the pinyon-juniper reference area and disturbed site at the Deer Creek Mine.

<u>Parameter</u>	<u>Reference</u>	<u>Disturbed</u>
Cover, % Density, No/Acre	37.0	36-40
Shrub	554	-
Tree	30	-
Species composition, s ¹	20	21
Aspect	Southeast	Southeast
Elevation, ft.	7,800	7,500-7,700
Slope, °	33-36	33-36
Soil	Ustorthent	Ustorthent
Geology	Colluvial	Colluvial
H'	2.03	-
H' _{max}	2.39	-
J	0.85	
Index of similarity, %		73.9

¹ total plant species

Table 9 Similarity between the riparian reference area and disturbed site at the Deer Creek Mine.

<u>Parameter</u>	<u>Reference</u>	<u>Disturbed</u>
Cover, %	72.7	70-75
Density, No/Acre		
Shrub	1,166	-
Tree	2,246	-
Species composition, s ¹	25	24
Aspect	Northeast	Northeast
Elevation, ft.	7,100	7,100-7,600
Slope, °	35-40	30-40
Soil	Haploboroll	Haploboroll
Geology	Alluvium	Alluvium
H'	1.87	-
H' _{max}	2.63	-
J	0.71	
Index of similarity, %		68.9

¹ total plant species

Table 10 Plant species occurring within the mixed-conifer reference area at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Abies concolor</u>	White fir
<u>Pinus edulis</u>	Pinyon pine
<u>P. flexilis</u>	Limber pine
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Acer glabrum</u>	Rocky Mountain maple
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Berberis repens</u>	Creeping barberry
<u>Chrysothamnus viscidiflorus</u>	Low rabbitbrush
<u>Clematis</u> sp.	Virginsbower
<u>Eriogonum</u> sp.	Wild buckwheat
<u>Pachistima myrtinises</u>	Myrtle pachistima
<u>Ribes aureum</u>	Golden current
<u>Sambucus cerulea</u>	Elderberry
<u>Symphoricarpos oreophilus</u>	Mountain snowberry
<u>Xanthocephalum sarothrae</u>	Snakeweed
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Castilleja chromosa</u>	Indian paintbrush
<u>Cirsium vulgare</u>	Bull thistle
<u>Eriogonum corymbosum</u>	Corymbed eriogonum
<u>Floerkea proserpinacoides</u>	False mermaid
<u>Galium</u> sp.	Galium
<u>Heterotheca villosa</u>	Hairy goldaster
<u>Machaeranthera canescens</u>	Hoary aster
<u>Melilotus officinalis</u>	Yellow sweetclover
<u>Petradoria pumila</u>	Rock goldenrod
<u>Senecio multilobatus</u>	Lobeleaf groundsel
<u>Trifolium</u> sp.	Clover
<u>Grasses</u>	
<u>Agropyron spicatum</u>	Bluebunch wheatgrass
<u>Elymus salinus</u>	Salina wildrye
<u>Festuca</u> sp.	Fescue
<u>Poa pratensis</u>	Kentucky bluegrass

Table 11 Ground cover by species for the mixed-conifer reference area at the Deer Creek Mine.

<u>Item</u>	<u>Percent Cover</u>
Trees	12.0
Douglas fir	9.5
White fir	1.5
Pinyon pine	1.0
Shrubs	12.3
Saskatoon serviceberry	3.8
Mountain snowberry	2.8
Creeping barberry	1.5
Low rabbitbrush	1.3
Golden current	1.3
Snakeweed	1.3
Elderberry	0.3
Forbs	9.0
Corymbed eriogonum	3.3
Galium	2.0
Rock goldenrod	1.5
Indian paintbrush	0.8
Louisiana sage	0.3
Bull thistle	0.8
Hoary aster	0.3
Grasses	14.3
Bluebunch wheatgrass	7.3
Salina wildrye	7.0
Total plant cover	46.5
Litter	10.0
Rock	15.5
Bare ground	28.0

Table 12 Shrub density and composition for the mixed-conifer reference area at the Deer Creek Mine.

<u>Species</u>	<u>Composition (%)</u>	<u>Density (No/Acre)¹</u>
Wild buckwheat	27	887
Saskatoon serviceberry	24	790
Mountain snowberry	24	790
Low rabbitbrush	12	395
Creeping barberry	9	296
Snakeweed	2	66
Myrtle pachistima	1	33
Rocky Mountain maple	1	33
	100	100

¹ Based on 25 sample observations. The mean area per plant was 1.23m²

Table 13 Tree density and composition by size class within the mixed-conifer reference area at the Deer Creek Mine.

<u>Species</u>	<u>Diameter at Breast Height</u> <u>(inches)</u>				<u>Composition %</u>
	<u>0-4</u>	<u>5-10</u>	<u>11-20</u>	<u>>20</u>	
White fir	14	4	5	0	39.7
Douglas fir	16	4	4	4	48.3
Pinyon Pine	1	1	0	0	3.4
Limber Pine	<u>2</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>8.6</u>
% of Total	56.9	20.7	15.5	6.9	100

Table 14 Plant species occurring within the pinyon-juniper reference area at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Juniperus osteosperma</u>	Utah juniper
<u>Pinus edulis</u>	Pinyon pine
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Artemisia tridentata</u>	Big sagebrush
<u>Cercocarpus ledifolius</u>	Curlleaf mountain mahogany
<u>Chrysothamnus viscidiflorus</u>	Low rabbitbrush
<u>Ephedra cutleri</u>	Cutler ephedra
<u>Symphoricarpos oreophilus</u>	Mountain snowberry
<u>Xanthocephalum sarothrae</u>	Snakeweed
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Cryptantha flavoculata</u>	Cryptantha
<u>Eriogonum corymbosum</u>	Corymbed eriogonum
<u>Galium</u> sp.	Galium
<u>Heterotheca villosa</u>	Hairy goldaster
<u>Petradoria pumila</u>	Rock goldenrod
<u>Senecio multilobatus</u>	Lobeleaf groundsel
<u>Grasses</u>	
<u>Agropyron spicatum</u>	Bluebunch wheatgrass
<u>Elymus salinus</u>	Salina wildrye
<u>Oryzopsis hymenoides</u>	Indian ricegrass

Table 15 Ground cover by species for the pinyon juniper reference area at the Deer Creek Mine.

<u>Item</u>	<u>Percent Cover</u>
Trees	11.1
Utah juniper	6.3
Pinyon pine	4.5
Douglas fir	0.3
Shrubs	8.5
Cutler ephedra	5.0
Saskatoon serviceberry	3.0
Low rabbitbrush	0.5
Forbs	2.3
Corymbed eriogonum	2.0
Galium	0.3
Grasses	15.4
Bluebunch wheatgrass	8.8
Salina wildrye	4.3
Indian ricegrass	2.3
Total plant cover	37.0
Litter	7.8
Rock	15.2
Bare ground	40.0

Table 16 Shrub density and composition for the pinyon-juniper reference area at the Deer Creek Mine.

Species	<u>Composition (%)</u>	<u>Density (No/Acre)¹</u>
Cutler ephedra	51	283
Saskatoon serviceberry	44	244
Mountain snowberry	1	5
Low rabbitbrush	3	17
Curlleaf mountain mahogany	<u>1</u>	<u>5</u>
	100	554

¹ Based on 45 observations. The mean area per plant was 7.31m²

Table 17 Tree density and composition by size class within the pinyon-juniper reference area at the Deer Creek Mine.

<u>Species</u>	<u>Diameter at Breast Height (inches)</u>				<u>Composition %</u>
	<u>0-4</u>	<u>5-10</u>	<u>11-20</u>	<u>>20</u>	
Utah juniper	8	2	3	9	55.0
Douglas fir	0	2	1	0	7.5
Pinyon Pine	<u>5</u>	<u>3</u>	<u>1</u>	<u>6</u>	<u>37.5</u>
% of Total	32.5	17.5	12.5	37.5	100

Table 18 Plant species occurring within the riparian reference area at the Deer Creek Mine.

<u>Scientific Name</u>	<u>Common Name</u>
<u>Trees</u>	
<u>Abies concolor</u>	White fir
<u>Juniperus scopulorum</u>	Rocky Mountain juniper
<u>Populus angustifolia</u>	Narrowleaf cottonwood
<u>Pseudotsuga menziesii</u>	Douglas fir
<u>Shrubs</u>	
<u>Acer glabrum</u>	Rocky Mountain maple
<u>Amelanchier alnifolia</u>	Saskatoon serviceberry
<u>Berberis repens</u>	Creeping barberry
<u>Cornus stolonifera</u>	Redosier dogwood
<u>Physocarpus sp.</u>	Ninebark
<u>Rhus trilobata</u>	Skunkbush
<u>Rosa woodsii</u>	Woods rose
<u>Salix exigua</u>	Coyote willow
<u>Symphoricarpos oreophilus</u>	Mountain snowberry
<u>Xanthocephalum sarothrae</u>	Snakeweed
<u>Forbs</u>	
<u>Artemisia ludoviciana</u>	Louisiana sage
<u>Cirsium vulgare</u>	Bull thistle
<u>Ipomopsis aggregata</u>	Skyrocket gilia
<u>Machaeranthera canescens</u>	Hoary aster
<u>Melilotus officinalis</u>	Yellow sweetclover
<u>Penstemon sp.</u>	Penstemon
<u>Trifolium sp.</u>	Clover
<u>Grasses</u>	
<u>Agropyron sp.</u>	Wheatgrass
<u>Bromus tectorum</u>	Cheatgrass
<u>Oryzopsis hymenoides</u>	Indian ricegrass
<u>Stipa commata</u>	Needle-and-Thread grass

Table 19 Ground cover by species for the riparian reference area at the Deer Creek Mine.

<u>Item</u>	<u>Percent Cover</u>
Trees	41.1
\ Narrowleaf cottonwood	23.6
Douglas fir	10.8
Rocky Mountain juniper	6.4
White fir	0.3
Shrubs	28.2
Rocky Mountain maple	19.2
Redosier dogwood	5.6
Woods rose	1.7
Saskatoon serviceberry	1.1
Mountain snowberry	0.3
Skunkbush	0.3
Forbs	3.3
Bull thistle	1.9
Hoary aster	1.1
Skyrocket gilia	0.3
Grasses	0.3
Indian ricegrass	0.3
Total plant cover	72.7
Litter	10.9
Rock	4.2
Bare ground	12.2

Table 20 Shrub density and composition for the riparian reference area at the Deer Creek Mine.

Species	<u>Composition (%)</u>	<u>Density (No/Acre)¹</u>
Rocky Mountain maple	41	478
Woods rose	20	233
Redosier dogwood	16	187
Mountain snowberry	8	93
Creeping barberry	5	58
Saskatoon serviceberry	4	47
Coyote willow	4	47
Ninebark	1	12
Skunkbush	<u><1</u>	<u><11</u>
	100	1166

¹ Based on 40 observations. The mean area per plant was 3.47m²

Table 21 Tree density and composition by size class within the riparian reference area at the Deer Creek Mine.

<u>Species</u>	<u>Diameter at Breast Height</u> <u>(inches)</u>				<u>Composition %</u>
	<u>0-4</u>	<u>5-10</u>	<u>11-20</u>	<u>>20</u>	
Narrowleaf cottonwood	466	217	123	155	38.6
Douglas fir	923	94	0	66	43.8
White fir	217	94	0	0	12.6
Rocky Mountain juniper	<u>94</u>	<u>32</u>	<u>0</u>	<u>0</u>	<u>5.0</u>
% of Total	68.4	17.7	5.0	8.9	100

Table 22 Deer, elk and moose utilization on the Ferron Ranger District of the Manti-LaSal National Forest

<u>Wildlife</u>	<u>Unit</u>	High Priority ¹ Winter ²		<u>AUM</u> ³	<u>No.</u> ⁴
		<u>Summer Range</u>	<u>Range</u>		
Deer	34 N	6,500	-	274	289
	35 S	5,450		282	297
			3,055	73	65
Elk	Manti Range	12,685	-	365	126
			2,320	27	8
			Critical 1,040	120	35
Moose	Entire allotment (Year long)		15,005	130	13

- 1 Total acres
- 2 Total acres
- 3 Animal unit month
- 4 Total animals

Table 23 Cattle utilization on the East Mountain allotment of the Ferron Ranger District, Manti-LaSal National Forest

<u>Total Acres</u>	<u>Land Ownership</u>	<u>AUM</u>
1,959	Private ¹	845
19,328	USFS	1,710

¹ Private land but still managed by the USFS.

VEGETATION MONITORING PLAN - DEER CREEK MINE

The purpose of this monitoring plan is to define and establish a system to locate, measure, and quantify the progressive and final effects of the underground mining activities at the Deer Creek mine on vegetation. The monitoring system will utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a sufficient number of points located on surface areas that will be impacted by underground mining. The monitoring shall be an extension of the baseline data as outlined in the Deer Creek PAP Volume 1.

Aerial photography taken annually will be used for delineation of vegetative types, documentation of changes in vegetation and detection and monitoring of stressed vegetation.

Infrared photography was taken of impacted surface areas during September, 1987. This will be repeated in 1992 and continued on a five year schedule.

Each vegetation type mapped and monitored will be based on a dominant overstory and a dominant understory species to be consistent with Unita-Southwestern Coal Region Data Adequacy Standards. The details of monitoring and analyses will be developed in cooperation with the US Forest Service.

The vegetation monitoring information and an evaluation of the impacts of mining on vegetation will be submitted in an annual report following the year in which monitoring is conducted.

SOILS INFORMATION R614-301-200

A soil survey was completed in the Rilda Canyon lease tract

area in August, 1990. The information resulting from that survey is presented at the end of the following soils information for the general Deer Creek Mine permit area.

Portal and support facility areas for the Deer Creek Mine are cut into steep, nearly perpendicular rock cliffs. The areas are dominated by rock outcrop, rubble land, and shallow soils.

Nowhere in the vicinity of the mine is there a source of material which would usually be referred to as "topsoil". Soil tests on the disturbed and undisturbed areas and coal waste show that the materials in the portal area should support selected vegetative materials. These test results, therefore, preclude the recommendation for procurement of topsoil for reclamation since the exposed materials are suitable growth media if properly managed. The one exception is that if during mining operations toxic substances are concentrated, it will be necessary to sample these areas periodically and take the necessary reclamation measures to dispose of or cover the areas in order to assure success of revegetation attempts. Results of soil analyses are summarized in Part 4, Reclamation Plan.

The applicant commits to fulfilling the requirements of this section for all new and previously undisturbed disturbances.

Soil Report of the Deer Creek Mine (see Maps 2-16 and 2-17)

C-Cut Areas

These are areas disturbed in order to effectively gain sufficient work area to carry out mining operations. Sandstone and shale bedrock are exposed. In general, these areas have chemical and physical properties which will support plant growth. The major

problems are steepness and aridity.

F-Fill Areas

These areas are nearly level (yard areas) and steep slopes (more than 25%). The material derived from sandstone and shale with some coal waste is capable of supporting plant growth. The parking lots and storage areas may have places where undesirable conditions for plant growth have developed; these areas will be covered with suitable growth media before revegetation can be successful.

Co-Be-Comodore-Beenom Complex, 40-60% Slopes

Comodore soils occur near drainageways, and support Douglas fir. They are shallow and well-drained (50%).

Beenom soils are shallow and well-drained. They occur in the areas which support mostly grass vegetation (40%). Included in mapping are other soils and Rock Outcrop.

Pedon descriptions follow:

Comodore is a loamy-skeletal, mixed, Lithic Cryoboroll.

A11--0-8 cm; very dark grayish brown (10YR 3/2) very stony, very fine sandy loam; very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; few very fine and fine pores; 15% gravel, 45% cobbles and stones non-calcareous; mildly alkaline (pH 7.4); clear, smooth boundary.

A12--8-45 cm; very dark grayish brown (10YR 3/2) very cobbly, very fine sandy loam; very dark brown (10YR 2/2) when moist; weak, fine granular structure; soft, friable, slightly

sticky, slightly plastic; common fine and medium, and coarse roots; few very fine pores; 15% gravel and 30% cobbles; non-calcareous; mildly alkaline (pH 7.4); abrupt wavy boundary.

R--45 cm; sandstone bedrock.

Beenom is a loamy mixed Lithic Argiboroll

A1--0-10 cm; brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine, fine, and medium pores; mildly alkaline (pH 7.6); abrupt smooth boundary.

B2t--10-35 cm; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; strong, medium, subangular blocky structure; hard, firm, sticky, plastic; common very fine, fine and medium roots; common very fine, and fine pores; few thin clay films on faces of peds; mildly alkaline (pH 7.6).

R--35 cm; sandstone.

These soils were not sampled for laboratory analysis since they are outside of the disturbed area.

Samples from the cut-and-fill slopes and the undisturbed slopes near the mine portal were analyzed. The results are shown in Tables 1 and 2, in the Revegetation section. There is no indication that any of these materials will not support plant growth. The furnace slag used in the parking lot has a high pH, but it is presumed that this is from the fusion of calcium oxide and has no detrimental influence on plant growth when mixed with other suitable material.

Ro-R-U Rock Outcrop - Rubble Land - Lithic Ustorthents, 40-70%

slopes

Rock Outcrop is dominantly from sandstone and shale. The boulders in the Rubble Land are from sandstone (75%).

Ustorthents soils are shallow and formed in material derived from sandstone. Permeability is moderately rapid in the soil material above the rock (25%).

Taxonomic classification¹ is loamy-skeletal, mixed, mesic, Lithic Ustorthents. Pedon description follows:

A0-4 inches; pale brown (10YR 6/3) very gravelly loam; olive brown (2.5 Y 5/4) when moist; weak, fine granular structure; friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; common fine and few medium pores; 55% gravel; moderately calcareous, carbonates are disseminated; moderately alkaline (pH 8.3); abrupt wavy boundary.

C1--4-14 inches; light gray (2.5 Y 7/2) extremely flaggy, fine sandy loam, light yellowish brown (2.5 Y 6/4) when moist; massive; very friable; few fine, medium and coarse roots; 40% flagstones; 30% channers; strongly calcareous, carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

R--14 inches; sandstone.

Included in mapping are areas of material which have sloughed and been deposited by gravity in small areas (less than 100 sq. ft.). The soil material is deeper than Lithic soils. These areas are of such limited extent that they are of no consequence as a

local source of cover material for revegetation.

¹ Reclassified by Dr. A.R. Southard in 1989.

REFERENCES

- American Association of State Highway Officials, 1955. Standard Specifications for Highway Materials and Methods of Sampling and Testing. Ed. 8.
- Portland Cement Association, 1956. PCA Soil Primer. 86 pp.
- Soil Science Society of America, 1973. Glossary of soil science terms. Soil Sci. Soc. of Amer. Madison, Wis. 33 pp.
- Soil Survey Staff. 1975. Soil taxonomy - a basic system of soil classification for making and interpreting soil surveys. USDA Handbook 436. GPO.
- Soil Survey Staff. 1954. Diagnosis and improvements of saline and alkali soils. USDA Handbook 60. GPO.
- Soil Survey Staff, 1951. Soil Survey Manual. Ag. Handbook 18. GPO.
- USDA SCS, 1979. Soil Series of the United States, Puerto Rico and Virgin Islands: their taxonomic classifications.
- USDA SCS, 1971. Guide for interpreting engineering uses of soils.
- USDA SCS, 1967. Soil survey laboratory methods and procedures for collecting soil samples. Soil Survey Investigations Report No.1. GPO.
- Wilson, L. et al, 1975. Soil of Utah. Utah Agric. Exper. Bull. 492. Logan Utah. 94 pp, with map.
- Soil Survey of Parts of Carbon and Emery Counties, Utah. April 1979 Vol. I and II.

GENERAL SOIL MAP OF THE PERMIT AREA

I-E-R Typic Ustochrepts-Lithic Ustorthents - Rock Outcrop
E loamy-skeletal, shallow association, 40-60%

These soils are mostly loamy-skeletal and lithic with areas of sandstone outcrops.

In this map unit, Typic Ustochrepts make up about 50%, Lithic Ustorthents about 25%, and Rock Outcrop and Rubble Land about 20%, included are small areas of Mollisols on north and east-facing slopes.

The Ustochrepts can be generally described as follows: pale brown gravelly loam or sandy loam surface layer, with 25% sandstone fragments, 35 cm thick, underlain by a pale brown gravelly or stony loam, with 35-50% sandstone fragments, 100 cm thick.

The Ustorthents are mostly shallow, underlain by rock within 50 cm of the surface.

Rubble Lands are those areas where the soils are covered by large boulders so close together that there is little area between the boulders for plants to grow.

Rock Outcrop is exposed areas of bedrock. These areas are often nearly vertical cliff walls in canyons.

Mp Pachic Cryoborolls, loamy and loamy skeletal, 10-25%
B slopes

These are dark-colored soils in which the surface soil is more than 50 cm thick. Included in mapping are Typic Cryoborolls, Mollic Cryoborolls, and Typic Cryochrepts. Pachic Cryoborolls can be generally described as follows: a very dark grayish-brown loamy surface layer 60 cm thick, overlying a grayish-brown loamy subsoil 30

cm thick, and underlain by a pale brown gravelly sandy loam substratum containing 50% sandstone fragments.

Mt Typic Cryoborolls, loamy and loamy-skeletal, 25-40%
C slopes

These are dark-colored soils under mixed conifer, sagebrush and grass. Included are areas of Pachic Cryoborolls and Mollic Cryoboralfs. Cryochrepts are on windswept ridges. The Typic Cryoborolls can be generally described as follows: a dark grayish brown loamy surface layer about 40 cm thick, underlain by a pale brown clayey subsoil 40 cm thick, over a light gray calcareous substratum with up to 50% sandstone fragments.

References

1. Soils maps of Utah Power and Light mine sites: Deer Creek, Deseret and Wilberg.
2. General soils map of Utah.
3. Soils map of a test area in T14S, R5E through 9E.
4. Soils map of Northwest Carbon, Inc., Rilda Canyon and Trail Creek Mine sites.

A SOIL SURVEY OF THE DEER CREEK MINE
RILDA CANYON LEASE TRACTS
PERMIT APPLICATION
SOIL RESOURCE INFORMATION

A report prepared for
Utah Power and Light Company
Huntington, Utah

by

Thomas H. Furst, Soils Consultant
649 Southwest Street
Logan, Utah 84321

10 October 1990

SOIL SURVEY

The fieldwork portion of the soil survey was conducted from 18-19 August 1990. The field survey consisted of 23 documented "quick pit" locations which were used to ascertain the thickness of the mollic epipedon. Three soil pedons were described and classified according to guidelines established in Soil Taxonomy (Soil Survey Staff, 1975) and sampled to provide baseline soils information for Map Units Mp/B (Pedons 1 and 2) and Mt/C (Pedon 3) of the lease tract. Pedon 1 was located near the boundary of Section 36, T16S, R6E and Section 31, T16S, R7E. Pedon 2 was located in the South 1/2 of the NW 1/4 of Section 32, T16S, R7E. Pedon 3 was located in the SW 1/4 of the SW 1/4 of Section 28, T16S, R7E. Pedon descriptions are included in the appendix. Map unit boundaries are as shown on Map, 2-16.

LABORATORY ANALYSES

Soil samples of Pedons 1, 2 and 3 were submitted to the Utah State University Plant and Soil Test Laboratory on 27 August 1990. Analyses included: Soil texture as determined by the hydrometer method (Day, 1965; method 42-5); Available Water Capacity was determined by the water retention difference method (USDA-SCS, 1984; method 4C1); Saturation percentage as determined in the preparation of the saturation paste extract (percent by mass); Electrical conductivity, pH, and alkalinity as determined on saturated paste extracts corrected to 25° C (Rhodes, 1982; methods 10-3.3, 10-3.2 and 10-2.3.1, respectively). The sodium adsorption ratio (SAR) as calculated on the water soluble concentrations of Ca, Mg and Na (Rhoades, 1982; method 10-3.4). Calcium carbonate content as

determined by the pressure-calculator method (Nelson, 1982; method 11-2.4); Organic carbon content as determined by the Walkley-Black procedure (Nelson and Sommers, 1982; method 29-3.5.2); Phosphorus content as determined by extraction with sodium bicarbonate at pH 8.5 (Olsen and Sommers, 1982; method 24-5.4).

Rock volume (%) of the soil materials was estimated in the field based on a visual estimate of the amount of gravels, cobbles, and rock fragments excavated during sampling. Soil color was measured with a Munsell soil color chart ("Munsell" is a registered trademark of Munsell Color, Macbeth A Division of Kollmorgen Corporation, 2441 North Calvert Street, Baltimore, Maryland 21218). The degree of slope was measured with an Abney Level to the nearest whole number percentage. Site aspect was estimated from map and compass readings.

RESULTS AND DISCUSSION

Results from laboratory analyses and pedon descriptions are included in the appendix of this report. Pedons 1 and 2 were classified as loamy-skeletal, mixed Pachic Cryoborolls based on pedon descriptions and substantiated by laboratory analyses. Both pedons contain more than 0.6% organic carbon in each horizon of the soil solum and the percent base saturation (as inferred from pH) is most likely greater than 50% throughout the solum. Soil textures are mostly clay loams (not rated in the DOGM guidelines for overburden evaluation) excepting the A horizon of Pedon 1 which is a loam ("good" rating for soil materials of the vegetative root zone). Electrical conductivity ranges from 0.3-0.5 mmhos/cm and the sodium adsorption ratio for all soil horizons of Pedons 1 and 2 is less than 3.3 (both

ECe and SAR receive "good" ratings for overburden evaluation of vegetative root zone, according to the DOGM guidelines). Soil reaction (pH) ranges from 7.6 to 7.9 which also falls in the "good" category rating for soil materials in the vegetative root zone. Alkalinity (HCO₃ in appendices) is less than about 4 meq/L for Pedons 1 and 2. The saturation percentages for all soil horizons ranges from 47.8 to 64.5%, which places this soil characteristic in the "good" rating category for overburden evaluation of the vegetative root zone, according to the DOGM guidelines. The available water capacities range from 0.12 to 0.22 inches of water per inch (depth) of soil. Calculation of the total available water in Pedon 1 reveals that about 4.2 inches of water would be available on a whole pedon basis when the displacement of soil material by coarse fragments is taken into account (Table 1). Similarly, calculation of the whole pedon available water capacity for Pedon 2 suggests that 3.9 inches of water are available after deduction of the coarse fragment fraction (Table 1).

Table 1 Available water capacities¹ calculated for each soil horizon of Pedons 1, 2 and 3.

HORIZON	Pedon 1		Pedon 2		Pedon 3	
	<u><2mm</u>	<u><2mm+c.f.</u>	<u><2mm</u>	<u><2mm+c.f.</u>	<u><2mm</u>	<u><2mm+c.f.</u>
	inches					
A	0.75	0.73	0.80	0.80	0.71	0.71
Bw1	2.60	2.47	3.39	2.54	0.66	0.53
<u>Bw2</u>	<u>1.97</u>	<u>0.99</u>	<u>1.48</u>	<u>0.52</u>	<u>4.62</u>	<u>2.31</u>
WHOLE PEDON	5.32	4.19	5.67	3.86	4.62	3.55

¹ Available water capacity (from laboratory data, appendix) X horizon thickness, summed over all soil horizons = whole pedon available water capacity; bulk density is assumed to be 1.2 g/cm³ in the A horizon and 1.4 g/cm³ in the Bw horizons; c.f. = coarse fragments, >2mm particles.

Pedon 3 was classified as a loamy-skeletal, mixed Typic Cryoboroll based on pedon description and laboratory analyses. The pedon was Typic instead of Pachic (Pedons 1 and 2) because the Munsell color value of the Bw2 horizon as >3.5 moist, which disqualifies this horizon from the Mollic epipedon concept and results in a Typic rather than Pachic designation at the subgroup level in Soil Taxonomy (Soil Survey Staff, 1990). The pedon does contain >0.6% organic carbon throughout the soil solum, and the percent base saturation (inferred from pH) is most likely >50% throughout the soil solum. Soil textures range from sandy loam in the A and Bw1 horizons to loam in the Bw2 horizon ("good" rating, according to DOGM). Electrical conductivity ranges from 0.4-0.5 mmhos/cm and the sodium adsorption ratio for all soil horizons of Pedons 1 and 2 is less than 3.4 (both Ece and SAR receive "good" ratings for overburden evaluation of vegetative root zone, according to the DOGM guidelines). Soil reaction (pH) ranges from 8.0 to 8.1 which also falls in the "good" category rating for soil materials in the vegetative root zone. Alkalinity (HCO₃ in appendices) is less than about 4 meq/L for Pedon 3. The saturation percentages over all soil horizons ranges from 44.6 to 52.6%, which places this soil characteristic in the "good" rating category for overburden evaluation of the vegetative root zone, according to the

DOGM guidelines. The available water capacities range from 0.10 to 0.15 inches of water per inch (depth) of soil. Calculation of the total available water in Pedon 3 reveals that about 3.6 inches of water would be available on a whole pedon basis when the displacement of soil material by coarse fragments is taken into account (Table 1).

SOIL MANAGEMENT

Future management of the soils on the Deer Creek Mine Rilda Canyon Lease Tracts should be focused on limiting site factors and soil characteristics. All soil characteristics carry a "good" rating according to "Table 2 Overburden evaluation for vegetative root zone" (Leatherwood and Duce, 1988). Limiting site factors center around (1) slope gradient, (2) cryic temperatures (the mean annual soil temperature at 50 cm (20 inches) depth is from 47-59° F), and (3) the increasing abundance of coarse fragments with depth in the soil. In general, all map units on the lease area have slope gradients that would preclude the minimization of surficial soil disturbance to reduce the potential for soil erosion. As the soil solum only ranges from 50-80 cm (20-30 inches) thick in all pedons described or documented, even slight erosion could be detrimental to established plant communities. The Cryic soil temperature regime also suggests that if revegetation were necessary, plant species which are adapted to this regime should be utilized for optimum success. Significant amounts of coarse fragments in the lower soil horizons result in decreased available water capacities in those layers. Again, under a revegetation scheme, plant species that could withstand periodic water stress (both in winter and summer) may prove successful.

LITERATURE CITED

- Day, P.R. 1965. Particle fractionation and particle size analysis. In: C.A. Black et al. (ed.) Methods of soil analysis. Part 1. Agronomy 9:545-667
- Leatherwood, J. and D. Duce, 1988. Guidelines for management of topsoil and overburden for underground and surface coal mining. State of Utah, Department of Natural Resources, Division of Oil, Gas, and Mining. Salt Lake City, Utah.
- Nelson, D.W. and L.E. Sommers. 1982. Total carbon, organic carbon, and organic matter. In: A.L. Page et al. (ed.) Methods of soil analysis, Part 2, 2nd edition. Agronomy 9:539-579.
- Nelson, R.E. 1982. Carbonate and gypsum. In: A.L. Page et al. (ed.) Methods of soil analysis, Part 2, 2nd edition. Agronomy 9:181-197.
- Olsen, S.R. and L.E. Sommers. 1982. Phosphorus. In: A.L. Page et al. (ed.) Methods of soil analysis, Part 2, 2nd edition. Agronomy 9:403-430.
- Rhoades, J.D. 1982. Soluble salts. In: A.L. Page et al. (ed.) Methods of soil analysis, Part 2, 2nd edition. Agronomy 9:167-179.
- Soil Survey Staff. 1975. Soil taxonomy. A basic system of soil classification for making and interpreting soil surveys. US Dept. Agric.-Soil Conservation Service Agricultural Handbook. No. 436. US Govt. Printing Office. Washington, D.C.
- Soil Survey Staff. 1990. Keys to Soil Taxonomy, fourth edition. SMSS technical monograph no. 6. Blacksburg, Virginia.
- USDA-SCS. 1984. Procedures for collecting soil samples and methods of analysis for soil survey. Soil Survey Investigations Report No.1.

APPENDIX

LABORATORY DATA

AND

SOIL DESCRIPTIONS

Pedon 1

Location: near the boundary of Section 36, T16S, R6E and Section 31, T16S, R7E.

Elevation: about 9850' above mean sea level

Aspect: northeast

Slope: 21%

Classification: loamy-skeletal, mixed Pachic Cryoborolls, 10-25% slopes

(All colors are moist unless otherwise noted)

<u>Horizon</u>	<u>Description</u>
A	0-10 cm; very dark brown (10YR 2/2); moderate, fine, granular and moderate, fine, angular blocky structure; very friable; effervesces strongly; many, very fine and fine roots; 2% gravel by volume; clear, wavy boundary.
Bw1	10-40 cm; very dark grayish brown (10YR 3/2); weak, fine and medium subangular blocky structure; slightly firm; effervesces violently; common, medium and few, fine roots; 5% gravel by volume, gradual, smooth boundary.
Bw2	40-65 cm; very dark grayish brown (10YR 3/2); very cobbly; weak, fine and medium subangular blocky structure; slightly firm; effervesces violently; few, medium and coarse roots; 50% cobbles by volume; gradual diffuse boundary.
C	65-85 cm: extremely cobbly; > 90% cobbles; fines (< 2mm) fill interstices between cobbles; few plant roots.

EDON 1, loamy-skeletal mixed Pachic Cryoborolls 10-25% slopes

Horizon	Depth (cm)	Sand %	Silt %	Clay %	Texture	Organic Carbon %	Total N %	NaHCO ₃ -P mg/kg
A	0-10	33	44	23	Loam	4.2	0.33	9.2
Bw1	10-40	28	43	29	Clay Loam	2.8	0.27	4.5
Bw2	40-65	29	42	29	Clay Loam	2.2	0.16	3.1

Horizon	Depth (cm)	Moisture Retention 1/3 ATM	Moisture Retention 15 ATM	Available Water in/in (1.2g/cc)	Water Saturation in/in (1.5g/cc)	Saturation Percentage
A	0-10	30.4	14.5	0.19	0.22	63.2
Bw1	10-40	26.6	14.5	0.15	0.22	58.4
Bw2	40-65	24.4	13.6	0.13	0.20	52.8

Horizon	Depth (cm)	pH	ECe mmhos/c	CaCq %	HCQ meq/L	SAR
A	0-10	7.9	0.5	21.9	4.07	2.69
Bw1	10-40	7.8	0.3	21.9	3.21	2.69
Bw2	40-65	7.9	0.3	30.0	3.28	2.62

Horizon	Depth (cm)	Water Soluble Cations			K mg/L
		Ca mg/L	Mg mg/L	Na mg/L	
A	0-10	98.24	6.73	19.48	16
Bw1	10-40	61.15	5.61	15.52	7
Bw2	40-65	56.39	8.32	14.91	4

PEDON 2

Location: South 1/2 of the NW 1/4 of Section 32, T16S, R7E.
Elevation: about 9400' above mean sea level
Aspect: north
Slope: 18%
Classification: loamy-skeletal, mixed Pachic Cryoborolls, 10-25% slopes
(All colors are moist unless otherwise noted)

<u>Horizon</u>	<u>Description</u>
A	0-12 cm; very dark brown (10YR 2/2); strong, very fine granular structure; very friable; effervesces strongly; many, very fine and fine roots; no gravels; gradual smooth boundary.
Bw1	12-55 cm; very dark grayish brown (10YR 3/2) gravelly; weak, fine and medium subangular blocky structure; slightly firm; effervesces violently; common, fine and medium roots; 25% gravel by volume; gradual, smooth boundary.
Bw2	55-80 cm; dark brown (10YR 3/3) very gravelly; weak, fine subangular blocky structure; slightly firm; effervesces violently; few, medium roots; 50-65% gravels and cobbles; gradual smooth boundary.
C	80-100 cm: extremely cobbly; > 90% cobbles; fines (< 2mm) fill interstices between cobbles; few plant roots.

UDON 2, loamy-skeletal, mixed Pachic Cryoborolls 10-25% slopes

Horizon	Depth (cm)	Sand %	Silt %	Clay %	Texture	Organic Carbon %	Total N %	NaHCO ₃ -P mg/kg
A	0-12	21	45	34	Clay Loam	3.62	0.28	54
Bw1	12-55	25	41	34	Clay Loam	2.75	0.22	12
Bw2	55-80	35	36	29	Clay Loam	2.07	0.18	16

Horizon	Depth (cm)	Moisture Retention 1/3 ATM	Moisture Retention 15 ATM	Available Water in/in (1.2g/cc)	Water Saturation in/in (1.5g/cc)	Saturation Percentage
A	0-12	32.1	17.6	0.17	0.22	64.5
Bw1	12-55	30.6	17.4	0.16	0.20	59.8
Bw2	55-80	21.6	11.5	0.12	0.15	47.8

Horizon	Depth (cm)	pH	ECe mmhos/c	CaCq %	HCQ meq/L	SAR
A	0-12	7.6	0.5	9.4	2.57	2.51
Bw1	12-55	7.6	0.3	7.2	3.0	3.33
Bw2	55-80	7.8	0.3	45.3	3.42	3.04

Horizon	Depth (cm)	Water Soluble Cations			
		Ca mg/L	Mg mg/L	Na mg/L	K mg/L
A	0-12	98.95	2.85	17.91	7
Bw1	12-55	59.5	2.42	18.55	3
Bw2	55-80	66.45	2.84	17.91	4

PEDON 3

Location: SW 1/4 of the SW 1/4 of Section 28, T16S, R7E.
Elevation: about 8300' above mean sea level
Aspect: northwest
Slope: 36%
Classification: loamy-skeletal, mixed Typic Cryoborolls, 25-40% slopes
(All colors are moist unless otherwise noted)

<u>Horizon</u>	<u>Description</u>
A	0-18 cm; very dark brown (10YR 2/2); moderate, very fine and fine granular structure; very friable; effervesces strongly; few, fine roots; no gravels; clear, smooth boundary.
Bw1	18-30 cm; very dark grayish brown (10YR 3/2) gravelly; weak, fine and medium subangular blocky structure; friable; effervesces strongly; few medium roots; 20% gravels and cobbles; gradual smooth boundary.
Bw2	30-85 cm; dark yellowish brown (10YR 4/4); very gravelly; weak, fine subangular blocky structure; firm; effervesces strongly; few, medium roots; 50% gravels and cobbles; gradual smooth boundary.
C	85-110 cm: extremely cobbly; > 90% cobbles; fines (< 2mm) fill interstices between cobbles; few plant roots.

EDON 3, loamy-skeletal, mixed Typic Cryoborolls

Horizon	Depth (cm)	Sand %	Silt %	Clay %	Texture	Organic Carbon %	Total N %	NaHCO ₃ -P mg/kg
A	0-18	61	23	16	Sandy Loam	2.38	0.15	6.6
Bw1	18-30	56	25	16	Sandy Loam	2.26	0.13	3.1
Bw2	30-85	38	41	21	Loam	2.13	0.1	1.9

Horizon	Depth (cm)	Moisture Retention 1/3 ATM	Moisture Retention 15 ATM	Available Water in/in (1.2g/cc)	Available Water in/in (1.5g/cc)	Saturation Percentage
A	0-18	17.6	9.0	0.10	0.13	50.8
Bw1	18-30	19.2	10.2	0.11	0.14	52.6
Bw2	30-85	20.5	10.2	0.12	0.15	44.6

Horizon	Depth (cm)	pH	ECe mmhos/c	CaCq %	HCQ meq/L	SAR
A	0-18	8	0.5	25	3.71	2.39
Bw1	18-30	8	0.4	24.9	4.07	2.56
Bw2	30-85	8.1	0.4	33.9	3.93	3.38

Horizon	Depth (cm)	Water Soluble Cations			
		Ca mg/L	Mg mg/L	Na mg/L	K mg/L
A	0-18	85.55	10.15	16.53	20
Bw1	18-30	72.87	9.77	16.43	10
Bw2	30-85	69.16	10.35	21.31	7

FISH AND WILDLIFE RESOURCES INFORMATION R614-301-322

The wildlife species, of primary interest, associated with the Rilda Canyon Lease Tract area are deer and elk. Portions of the area provide critical and high priority summer and winter range for both species. The area is also ranked as substantial value, year long range for mountain cottontail. Additional fish and wildlife information is presented in the following general permit area discussion.

As required by the regulations the applicant has consulted with the DOGM, the DOWR and US Fish and Wildlife Service. An on-site field investigation of each mine site was conducted. In addition, the applicant felt to properly mitigate wildlife concerns a consultant (Jarvis) was retained to provide both wildlife baseline information and, in consultation with the US Fish and Wildlife Service, initiate any necessary studies and identify any possible conflicts between wildlife and mining operations. This report is included in this section. Notwithstanding Judge Flannery's decision, applicant feels that without baseline data a proper wildlife mitigation plan cannot be developed.

As the Jarvis report and the DOWR baseline data are for the most part redundant, applicant has chosen to include only the consultant's report in this application but has included the mitigation and impact avoidance procedures as recommended by the DOWR in the Fish and Wildlife Protection Plan. The applicant has the DOWR's complete baseline studies on file and copies have been sent to all concerned state and federal management agencies.

Mine Plan Area

The PacifiCorp (successor in interest to UP&L) lease area covers

the south half of East Mountain in the Wasatch Plateau. Life zones range from Upper Sonoran below the mines to Canadian on top. The three mines are located in steep rocky canyons on the south and east slopes of the mountain.

Methods

The mine plan was submitted to DOGM who, in turn, consulted the respective wildlife agencies for recommendations. Based on the Board's guidelines most of the wildlife information was obtained from existing records and publications. A field survey was conducted in 1981 to assess the occurrence of raptors and migratory birds nesting at the Cottonwood Fan Portal construction site. Additional surveys, which include the entire permit area, have been conducted annually since 1986, to assess the impacts of mining on raptors.

Wildlife habitats were coordinated with the designations used in the vegetative survey. With the vegetative map and the species list for the Wasatch Plateau a list of species likely to occur in the mine area was developed (Table 1).

Wildlife Habitats

The habitats within the mine plan area are rated as 1 and 2 by Bob Scott and other for coal lands of Utah (Scott, 1977). Around the mines the cliffs are considered raptor nesting habitat with the slopes below and the flat lands above the cliffs as raptor hunting areas. The lower slopes and alluvial fans below the mines are rated as critical deer and elk winter range. Most elk range is above the mines on the top of East Mountain (Table 2) (see Map 2-19).

The habitats at the Cottonwood and Des Bee Dove Mines are

designated as pinyon-juniper with many open rock and cliff areas. At the Deer Creek Mine some riparian habitat exists along Deer Creek below the mine. The south facing slopes of this steep canyon are covered with pinyon-juniper and the north facing slopes are covered with a mixed conifer stand.

The habitat designations are listed below:

S - Sagebrush

G - Grassland

SD - Salt Desert Shrub

R - Riparian

P-J- Pinyon-Juniper

MC - Mixed Conifer (includes Aspen Groves)

- a. Sagebrush - All the sagebrush communities are situated between 8,000 and 10,000 foot elevations along the top of the East Mountain plateau. They exist as short sage communities generally on ridge tops and flats. Aspen groves are scattered through the sagebrush communities on the flats and along the edges. A few areas around springs still harbor small wet meadows.
- b. Grassland - Two small areas on ridges in tributaries of Cottonwood Creek.
- c. Salt Desert Shrub - This plant community is located on the lower slopes adjacent to the access road to the Des Bee Dove Mines.
- d. Riparian - The streams are small and flow through steep narrow canyons. Consequently the riparian zone is very

narrow often less than 30 yards wide. The vegetative composition varies from the broad-leafed trees and shrub plant community normally depicted as characteristic of riparian areas to many areas where there is only an increased density of conifers and/or aspen.

- e. Pinyon-Juniper - This pygmy forest is located on steep slopes and talus slides that are crowned by near vertical to vertical rock escarpments. In many areas especially on the south face of East Mountain the forest consists of scattered trees growing amidst high rocky cliffs and rough rock piles. Where steep canyons occur the pinyon-juniper forest is only found on south facing slopes or on rocky exposed ridges. In many areas where the pinyon-juniper grades into the mixed stands a mountain brush plant community exists as an ecotone between the two tree dominated plant communities. These areas are generally confined to a single slope of less than 200 acres.
- f. Mixed Conifer - The mixed community is spread all over East Mountain, on the top, the slopes, and in the steep side canyons. Below 8,000 feet elevation conifers are found only on north facing slopes in steep canyons. Fir species generally dominate the stands along with spruce and a scattering of aspens at the sagebrush interface.

Wildlife List (See Table 1)

Species of Special Significance

The species listed here and their habitat requirements are

discussed in the following paragraphs. This list was derived from Utah Division of Oil, Gas and Mining's guidelines and from Utah Division of Wildlife Resources' status list (DOGM 1980 and UDWR 1979).

<u>SPECIES</u>	<u>STATUS</u>	<u>HABITAT</u>	<u>COMMENTS</u>
Western Bluebird (<u>Sialia mexicana</u>)	Federal Migratory	MC, P-J	Probably occurs within disturbed area.
American Peregrine Falcon (<u>Falco peregrinus</u>)	T & E	All	Does not occur, no sightings.
Bald Eagle (<u>Haliaeetus leucocephalus</u>)	T & E	All	Winter visitor.
Snowshoe Hare (<u>Lepus americanus</u>)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area.
Northern Flying Squirrel (<u>Glaucomys sabrinus</u>)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area.
Red Bat (<u>Lasiurus cinereus</u>)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area.
Utah Mountain Kingsnake (<u>Lampropeltis pyromelana</u>)	DWR Limited	R, P-J, MC	Possibly occurs in disturbed area.
Utah Milksnake (<u>Lampropeltis triangulum</u>)	DWR Limited	MC	Probably occurs on permit area

Tiger Salamander
(Ambystoma tigrinum)

DWR R
Questioned

but not in
disturbed
area.

Probably
occurs on
permit area
but not in
disturbed
area.

Threatened and Endangered

A letter from US Fish and Wildlife Service dated November 6, 1980. "To the best of our knowledge, no endangered or threatened plant species or critical habitat or threatened or endangered wildlife species occur in the disturbed areas of the subject mining operations."

Effects of Mining Operations on Fish and Wildlife

The effects of mining on wildlife are being evaluated through various studies being conducted within and adjacent to the permit area. A major raptor study is presently being conducted at the Cottonwood Mine in cooperation with the DWR, BLM, USFS and DOGM. Portions of the study include the Deer Creek Mine area. Results of the study indicate that raptor nesting in the area of the Deer Creek mine has not been detrimentally affected by mining operations. Nesting and production of young have continued uninterrupted. (See Annual Monitoring Reports and Assessment of Mining Related Impacts in Newberry Canyon.) As part of the raptor study, deer kills along the county road are monitored.

The lower open slopes are used by raptors for hunting activities where an abundance of rodents and small birds provide a prey base. Wintering migrants also utilize these same habitats for hunting. The vehicle traffic and human presence appears not to have disrupted raptor behavior.

The traffic on the mine access roads kills an unknown number of deer each year. The percent loss to the wintering deer herds is not considered significant by DWR (personnal communication with Larry Dalton).

Some riparian habitat was displaced when the mine facilities were originally constructed (prior to 1977).

Following is a summary of certain reptile and amphibian species referred to in Utah Division of Oil, Gas and Mining letter to applicant dated December 5, 1980.

- a. Utah Mountain Kingsnake - These snakes are widely distributed throughout the mountains of Utah in specific localized drainages. The habitat requirements are drainages with wet meadows, brushy riparian areas and perennial streams. They use rocky south facing slopes adjacent to riparian habitat for denning.
The drainages around East Mountain lack these components for a preferred environment because many of the stream are eroded and lack meadows. Thus it is doubtful these snakes inhabit any of the disturbed areas.
- b. Utah Milksnake - This snake could occur in the riparian areas and in the mixed conifer habitat. Most likely place would be in that portion f the drainages with mixed conifer vegetation.
- c. Tiger Salamander - These salamanders prefer quiet pools, ponds, or springholes. Since most of these water types occur on top of East Mountain is it doubtful any tiger salamanders would be disturbed by proposed construction.

Game Species

- a. Mule Deer (Odocoileus hemionus) - Mule deer range throughout all habitats on the mine property. Pinyon-juniper on the slopes of East Mountain are used as winter range. During other seasons deer concentrations are greater at high elevations.
- b. Elk (Cervus canadensis) - Elk primarily inhabit the sagebrush, and forest areas at the upper elevations on East Mountain. During winter months they range into pinyon-juniper habitat.
- c. Mountain Lion (Felis concolor) - This species inhabits rugged mountains and forest areas in the region and may occasionally occur on East Mountain (Dalton, 1977).
- d. Snowshoe Hare (Lepus americanus) - This species occurs in forested portions of mountainous areas in the region. It inhabits higher elevations on East Mountain (Dalton, 1977).
- e. Mountain Cottontail (Sylvilagus nuttalli) - Mountain cottontails inhabit brushy areas and forests, particularly on rocky slopes throughout the mine region (USDI Bureau of Land Management, 1976).
- f. Blue Grouse (Dendragapus obscurus) - Open conifer stands with brushy understory at higher elevations provide suitable habitat for this species. Blue grouse occur on East Mountain. The greatest density of the species in Utah is in the northern Wasatch Range (Rawley and Bailey, 1972).
- g. Ruffed Grouse (Bonasa umbellus) - Brushy woodlands (aspens,

willows and conifers) near streams and springs are suitable habitat. This species occurs at higher elevations on East Mountain, but good populations are generally limited to the Wasatch Range northwest of the mine property (Rawley and Bailey, 1972).

- h. Chukar Partridge (Alectoris graeca) - This species prefers steep, rock, semiarid slopes with low shrubs and rock outcrops. This species was introduced in Utah from 1951 to 1968. During this period 185,911 individuals were released at 191 different locations (Rawley and Bailey, 1972). The species is now widely distributed throughout Utah and other western states.
- i. Mourning Dove (Zenaidura macroura) - This is an important game bird in many parts of North America. Mourning doves prefer open field and forest edge habitat, but occur over a broad range of vegetation types throughout the 48 conterminous United States. The species occurs in pinyon-juniper and forest edge habitat on East Mountain.

Special Status Species

No federally listed endangered or threatened species are known to occur on the site property (USDI, Fish and Wildlife Service, 1976). The black-footed ferret (Mustela nigripes), a federally endangered species, has been reported near Ferron, several miles south of the site (Dalton, 1977). This species is not likely to occur on mine property because preferred habitat (a prairie dog town) (USDI Bureau of Land Management, 1972a) is not present. American peregrine falcon (Falco peregrinus anatum) has been

observed within 25 miles of the site (Dalton, 1977). It is probably a winter visitor in the area (USDI Bureau of Land Management, 1972b), although, historically peregrine falcon aeries existed in the San Rafael swell area 30 miles southeast of the site.

The State of Utah has defined the status of selected animal species (Utah Division of Wildlife Resources 1976), some of which are likely to occur on or near the Deer Creek Mine property as:

DECLINING: Any species of animal which, although still occurring in number adequate for survival, has been greatly depleted and continues to decline. A management program including protection or habitat manipulation, is needed to stop or reverse the decline.

LIMITED: Any species of animal occurring in limited numbers due to restricted or specialized habitat or at the perimeter of its historic range.

STATUS QUESTIONED: Insufficient data are available to permit a reliable assessment of the status of the species.

Special status species in Utah that might be found near the mine property are:

- a. Bobcat (Lynx rufus) - Declining. Fur prices in recent years have resulted in high harvests. The species is presently under consideration for total protection until the current population trend is reversed. Bobcats probably occasionally use the habitats present on the mine property.
- b. Whitetail Jackrabbit (Lepus townsendi) Status Questioned. Inhabits sagebrush flats in the region and may occur on site.
- c. Sandhill Crane (Grus canadensis) Limited. A few individuals

migrate through the region (Robbins et al, 1966).

d. Fox Sparrow (Passerella iliaca) Status Questioned. Suitable habitat for the species occurs at upper elevations on East Mountain on the mine property.

e. Utah Mountain Kingsnake (Lampropeltis pyromelana infralabialis) Limited. Suitable habitat occurs on site. These species are in the region and may inhabit the mine area (Stebbins, 1966).

BIBLIOGRAPHY

Dalton, L.D. and others, 1978, Species List of Vertebrate Wildlife That Inhabit Southeastern Utah. Utah Division of Wildlife Resources Publication #78-16, Salt Lake City, Utah.

DOGMR, Dec. 5, 1980 Guidelines for Fish and Wildlife Plan, Letter.

Robbins, C.S., Bruun, B., and Zim, H.S., 1966, A Field Guide to Identification of Birds of North America, Golden Press, New York, New York.

Scott, R.W. Boner, T.C. and Smith, R., 1977, Ranking of Wildlife Value on Federal Coal Lands, Utah Division of Wildlife Resources, Salt Lake City, Utah.

Stebbins, R.C., 1966, A Field Guide to western Reptiles and Amphibians, Houghton Mifflin Company, Boston, Mass.

UDWR, 1979, Status of Selected Animal and Plant Species in Utah (revised) Salt Lake City, Utah.

TABLE I
VERTEBRATE SPECIES OF THE WASATCH PLATEAU

Fishes:

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Cutthroat trout	C	lakes, streams	
Rainbow trout	C	"	
Brown trout	C	"	
Brook trout	L	"	
Carp	C	"	
Utah chub	C	"	
Leatherside chub	C	streams	
Longnose dace	U	"	
Speckled dace	C	"	
Redside shiner	C	lakes, streams	
Bluehead sucker	C	"	
Mountain sucker	L	streams	
Mottled sculpin	C	"	
Largemouth bass	C	lakes	

Amphibians:

Tiger salamander	C	R, MC	X
Great Basin Spadefoot toad	C	S	X
Western toad	K	R	X
Woodhouse's toad	C	G,S	
Chorus frog	C	S	X
Leopard frog	C	R	X

Reptiles:

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Collared Lizard	C	SD	X
Leopard Lizard	C	SD	
Eastern Fence Lizard	C	SD,P-J	X
Sagebrush Lizard	C	SD,P-J	X
Tree Lizard	C	P-J	X
Side-blotched Lizard	C	SD	X
Short-horned Lizard	C	SD,P-J,S,MC	X
Western Whiptail	C	SD	
Rubber Boa	C	MC	X
Striped Whipsnake	C	SD,P-J	X
Racer	C	S,MC	X
Ringneck Snake	K	R,MC	X
Gopher Snake	C	SD,P-J,S	X
Milk Snake	K	MC	X
Sonora Mountain Kingsnake	K	R,P-J,MC	X
Western Terrestrial Garter Snake	C	R,P-J,MC	X
Common Garter Snake	K	R	X
Night Snake	C	SD	
Midget Faded Rattlesnake	C	P-J	X

Birds:

Common Loon	U	Lakes
Horned Grebe	R	"
Eared Grebe	C	"
Western Grebe	C	"
Pied-billed Grebe	C	"

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Double-crested Cormorant	U	"	
Snowy Egret	C	Marshes	
Great Blue Heron	C	"	X
Black-crowned Night Heron	C	"	
American Bittern	U	"	
White-faced Ibis	C	"	
Whistling Swan	O	"	
Canada Goose	C	"	
White-fronted Goose	R	Marshes	
Snow Goose	U	"	
Ross's Goose	O	"	
Mallard	C	"	X
Gadwall	C	"	
Pintail	C	"	
Green-winged Teal	C	"	X
Blue-winged Teal	C	"	
Cinnamon Teal	C	"	
American Widgeon	C	"	
Northern Shoveler	C	"	
Wood Duck	R	"	
Redhead	C	Lakes	
Ring-necked Duck	U	"	
Canvasback	C	"	
Greater Scaup	U	"	
Lesser Scaup	C	"	

Birds cont.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Common Goldeneye	U	Lakes	
Bufflehead	U	"	
Ruddy Duck	C	"	
Hooded Merganser	R	Streams	
Common Merganser	C	Streams	
Red-breasted Merganser	C	"	
Turkey Vulture	C	A11	X
Goshawk	C	MC	X
Sharp-shinned Hawk	U	MC,S	X
Cooper's Hawk	C	R,MC,P-J	X
Red-tailed Hawk	C	A11	X
Swainson's Hawk	U	S,P-J	X
Rough-legged Hawk	C	SD	X
Ferruginous Hawk	U	SD	X
Golden Eagle	C	A11	X
Bald Eagle	E	A11	X
Marsh Hawk	C	SD	
Osprey	U	Lakes	
Prairie Falcon	C	P-J	X
Peregrine Falcon	E	A11	
Merlin	C	P-J	X
American Kestrel	C	R,SD,P-J	X
Blue Grouse	C	MC	X
Ruffed Grouse	C	MC	X
Sage Grouse	C	S	
California Quail	C	R	

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Chukar	C	SD	
Ring-necked Pheasant	C	Fields	
Sandhill Crane	R	Marshes	
Virginia Rail	C	"	
Sora Rail	U	"	
Common Gallinule	R	"	
American Coot	C	"	
Semipalmated Plover	U	"	
Snowy Plover	U	"	
Killdeer	C	S	X
Mountain Plover	R	Marshes	
American Golden Plover	U	"	
Black-bellied Plover	C	"	
Common Snipe	C	S	X
Long-billed Curlew	U	Marshes	
Willet	U	"	
Spotted Sandpiper	C	S	X
Solitary Sandpiper	U	Marshes	
Greater Yellowlegs	U	"	
Lesser Yellowlegs	C	"	
Pectoral Sandpiper	U	"	
Baird's Sandpiper	U	"	
Least Sandpiper	C	"	
Western Sandpiper	C	"	
Sanderling	U	"	
Short-billed Dowitcher	U	"	
Long-billed Dowitcher	C	"	

Birds Con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Marbled Godwit	C	Marshes	
American Avocet	C	"	
Black-necked Stilt	C	"	
Wilson's Phalarope	C	"	
Northern Phalarope	C	Lakes	
Herring Gull	U	"	
California Gull	C	"	
Ring-billed Gull	C	"	
Franklin's Gull	C	"	
Bonaparte's Gull	U	"	
Forsters Tern	C	"	
Common Tern	U	"	
Black Tern	C	"	
Caspian Tern	U	"	
Band-tailed pigeon	U	MC	
Rock Dove	C	P-J	
Mourning Dove	C	All	X
Yellow-billed Cuckoo	K	R	
Barn Owl	K	P-J	
Screech Owl	U	R	X
Flammulated Owl	K	MC	X
Great Horned Owl	C	All	X
Pygmy Owl	K	R,P-J	X
Burrowing Owl	L	SD	

Birds Con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Long-eared Owl	C	P-J	X
Short-eared Owl	C	Marshes	
Saw-whet Owl	K	MC	X
Common Nighthawk	C	SD	X
Poor-will	C	P-J	X
Black Swift	U	MC	X
White-throated Swift	C	P-J	X
Black-chinned Hummingbird	C	R	X
Broad-tailed Hummingbird	C	All	X
Rufous Hummingbird	C	MC	X
Calliope Hummingbird	C	MC	X
Belted Kingfisher	U	R	
Common Flicker	C	MC	X
Yellow-bellied Sapsucker	C	MC	X
Hairy Woodpecker	C	MC	X
Downy Woodpecker	C	R	X
Northern Three-toed Woodpecker	U	MC	X
Western Kingbird	C	SD	
Cassin's Kingbird	U	P-J	X.
Eastern Kingbird	C	R	
Ash-throated Flycatcher	C	SD	
Says Phoebe	C	SD, P-J	
Willow (Traill's) Flycatcher	C	S	X 2-82
Hammond's Flycatcher	U	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Dusky Flycatcher	C	MC	X
Gray Flycatcher	K	S,P-J	X
Western Flycatcher	C	MC	X
Western Wood Peewee	C	MC	X
Olive-sided Flycatcher	U	MC	X
Horned Lark	C	SD...	X
Violet-green Swallow	C	All	X
Tree Swallow	C	S	X
Bank Swallow	C	R	
Rough-winged Swallow	C	R	
Barn Swallow	C	P-J	X
Cliff Swallow	C	P-J	X
Purple Martin	U	MC	X
Steller's Jay	C	MC	X
Gray Jay	R	MC	X
Scrub Jay	C	R,P-J	X
Black-billed Magpie	C	R,P-J	X
Common Raven	C	All	X
Common Crow	O	R	
Pinion Jay	C	S,P-J	X
Clark's Nutcracker	C	MC	X
Black-capped Chickadee	C	MC	X
Mountain Chickadee	C	MC	X
Plain Titmouse	C	P-J	X
Bushtit	C	MC	X
White-breasted Nuthatch	C	MC	X
Red-breasted Nuthatch	C	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Pygmy Nuthatch	C	MC	X
Brown Creeper	C	MC	X
Dipper	C	R	
House Wren	C	MC	X
Rock Wren	C	SD,P-J	X
Canyon Wren	C	P-J	X
Bewick's Wren	C	P-J	X
Long-billed Marsh Wren	L	marshes	
Mockingbird	U	R	
Gray Catbird	U	R	
Sage Thrasher	C	S	X
American Robin	C	R,MC	X
Hermit Thrush	C	MC	X
Swainson's Thrush	C	MC	X
Veery	U	R	
Western Bluebird	U	MC,P-J	X
Mountain Bluebird	C	S,MC	X
Townsend's Solitaire	C	MC,P-J	X
Blue-gray Gnatcatcher	C	R	X
Golden-crowned Kinglet	U	MC,P-J	X
Ruby-crowned Kinglet	C	MC	X
Water Pipet	C	plains	
Bohemian Waxwing	U	R,MC	X
Cedar Waxwing	C	woodlands	
Northern Shrike	U	SD	
Loggerhead Shrike	C	SD	
Starling	C	All	X

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Solitary Vireo	U	R,P-J	X
Warbling Vireo	C	R	X
Orange-crowned Warbler	C	MC	X
Nashville Warbler	U	MC	X
Virginia's Warbler	C	P-J	X
Yellow Warbler	C	R	
Magnolia Warbler	U	MC	X
Yellow-rumped Warbler	C	MC	X
Black-throated Gray Warbler	C	P-J	X
Townsend's Warbler	U	MC	X
MacGillivray's Warbler	C	R	X
Yellowthroat	L	R	
Yellow-breasted Chat	C	R	
Wilson's Warbler	C	R	X
American Redstart	U	R	
House Sparrow	C	cities	
Western Meadowlark	C	SD	
Yellow-headed Blackbird	C	marshes	
Red-winged Blackbird	C	"	
Northern Oriole	C	R	
Rusty Blackbird	O	R	
Brewer's Blackbird	C	R	
Common Grackle	A	R	
Brown-headed Cowbird	C	R	X
Western Tanager	C	MC	X
Black-headed Grosbeak	C	R	X
Lapland Longspur	R	G	

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Indigo Bunting	R	R	
Lazuli Bunting	C	R,S	X
Green-tailed Towhee	C	S, P-J	X
Rufous-sided Towhee	C	S	X
Lark Bunting	O	SD	
Savannah Sparrow	C	G	
Grasshopper Sparrow	R	G	
Vesper Sparrow	C	S, SD	X
Lark Sparrow	C	S, SD	X
Sage Sparrow	U	S, SD	X
Dark-eyed Junco	C	MC	X
Gray-headed Junco	C	MC	X
Tree Sparrow	U	R	X
Chipping Sparrow	C	MC,P-J	X
Brewer's Sparrow	C	S,SD	X
Harris Sparrow	U	P-J	
White-crowned Sparrow	C	P-J	X
Fox Sparrow	K	R	X
Lincoln's Sparrow	U	R	
Song Sparrow	C	G	X
Black-throated Sparrow	U	S,P-J	X
Evening Grosbeak	C	MC	X
Cassin's Finch	C	MC	X
House Finch	C	All	X
Pine Grosbeak	U	MC	X
Rosy Finch	C	S	
Pine Siskin	C	MC	X

Birds con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
American Goldfinch	C	R,P-J	X
Lesser Goldfinch	C	P-J	X
Red Crossbill	U	MC	X
<u>Mammals:</u>			
North Water Shrew	C	R	
Merriam Shrew	U	S,MC	X
Vagrant Shrew	C	R	
Masked Shrew	C	R	
Dusky Shrew	C	MC	X
Little Brown Myotis	C	P-J	X
Fringed Myotis	U	SD, P-J	X
Long-Eared Myotis	C	MC	X
Long-legged Myotis	C	P-J	X
Yuma Myotis	U	P-J	X
California Myotis	C	"	X
Small-footed Myotis	U	"	X
Silver-haired Bat	C	MC	X
Western Pipistrelle	C	P-J	X
Big Brown Bat	C	"	X
Red Bat	U	MC	X
Hoary Bat	U	"	X
Western Big-eared Bat	C	P-J	X
Pallid Bat	C	SD	
Mexican Free-tailed Bat	C	SD	X
Pika	C	MC,P-J	X
White-tailed Jackrabbit	C	S	X

Mammals con't.

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Snowshoe Hare	C	MC	X
Black-tailed Jackrabbit	C	SD,P-J	X
Mountain Cottontail	C	S,G	X
Desert Cottontail	C	SD,P-J	X
White-tailed Prairie Dog	C	SD	
Red Squirrel	C	MC	X
Rock Squirrel	C	SD,P-J	X
Uintah Ground Squirrel	C	G, S	X
Golden-mantled Ground Squirrel	C	S,MC	X
Whitetail Antelope Squirrel	C	SD	X
Yellow-bellied Marmot	C	S,MC	X
Northern Flying Squirrel	C	MC	X
Least Chipmunk	C	S,SD,P-J	X
Uintah Chipmunk	C	MC	X
Cliff Chipmunk	U	P-J	X
Northern Pocket Gopher	C	G, S	X
Valley or Botta Pocket Gopher	C	G,S, P-J	X
Ord Kangaroo Rat	C	SD, P-J	X
Great Basin Pocket Mouse	C	SD	X
Beaver	C	R	X
Western Harvest Mouse	C	G, R	X
Canyon Mouse	C	P-J	X
Deer Mouse	C	All	X
Brush Mouse	C	P-J	X
Pinion Mouse	C	P-J	X
Desert Wood Rat	C	SD, P-J	X 2-88
Bushy-tailed Wood Rat	C	MC, P-J	X

Mammals con't

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Meadow Vole	C	S	X
Mountain Vole	C	S	X
Richardson's Vole	C	R	X
Longtail Vole	C	S, R	X
Black Rat	C	Mines	X
Norway Rat	C	"	X
House Mouse	C	"	X
Western Jumping Mouse	C	R	
Porcupine	C	MC	X
Coyote	C	All	X
Red Fox	C	MC	X
Kit Fox	U	SD	
Gray Fox	C	P-J	X
Black Bear	C	MC	X
Ring-tailed Cat	C	P-J	X
Raccoon	O	R	X
Short-tailed Weasel	R	P-J	X
Long-tailed Weasel	C	R	X
Mink	L	streams	
Black-footed Ferret	E	SD	
Marten	R	MC	X
Badger	C	S,MC,P-J	X
Striped Skunk	C	P-J	X
Spotted Skunk	C	R	X
River Otter	R	streams	

Mammals con't

Species	Status	Habitat	Probable Occurrence on UP & L Leases
Bobcat	C	MC,P-J	X
Cougar	C	Mc,P-J	X
Mule Deer	C	All	X
Moose	L	R	
Rocky Mountain Elk	C	MC	X

TABLE I
KEY

Status	-	Population
C	-	Common, Widespread and Abundant
U	-	Uncommon, Widespread but not Abundant
R	-	Rare, Seldom Seen.
E	-	Endangered, Candidate for Extinction
T	-	Threatened, Candidate for Endangered
L	-	Limited, Restricted to a Specific Habitat
K	-	Status Unknown

Habitat	-	
S	-	Sagebrush
G	-	Grassland
SD	-	Salt Desert Shrub
R	-	Riparian
P-J	-	Pinyon-Juniper Forest
MC	-	Mixed Conifer (Includes Aspen Groves)

TABLE II

Wildlife Rankings of Habitat within
Mine Portal Areas

Mine	Section	Ranking ^a	Principal Use
Deer Creek	T 17 S R 7 E Sec. 10	2	DWR
Des-Bee-Dove	T 17 S R 7 E Sec. 26	2	DWR
Wilberg	T 17 S R 7 E Sec. 27	2	DWR
Cottonwood Fan Portal Zone	T 17 S R 7 E Sec. 30	1	EWR DWR
	T 17 S R 6 E Sec. 25	1	EWR DWR
	Sec. 36	2	DWR

^a (Scott, 1977)

- 1 - Critical
- 2 - High Priority

LAND USE INFORMATION R614-301-410

The US Forest Service Land and Resource Management Plan (1986) for the Manti-LaSal National Forest indicates the lands uses, in the area of the Rilda Lease Tracts, include timber, wood fiber and forage production. The area also provides critical, high priority and substantial valued wildlife habitat. Additional discussion of land uses associated with the general Deer Creek Mine permit area follows.

Geographically, the permit encompasses, for the most part, a relatively large plateau named East Mountain situated between two major drainages, Cottonwood and Huntington. Two separate and distinct environs are characterized within the upper and lower limits of the plateau. Plateau elevations reach 10,000 feet accounting for the 20 inches plus of annual precipitation.

Forested communities dominate the higher regions with abundant shrub cover for smaller animal habitat. Large game animals such as deer and elk are present during all seasons.

By contrast, the lower drainage area is much dryer where south-facing slopes support the arid plant communities of pinyon-juniper and sagebrush. Plant cover shrubs and grasses are sparse by comparison.

The affected area, or portal area, lies within a steep narrow canyon (Deer Creek) in the transitional zone from valley to plateau crest at the outcrop of the Blind Canyon coal seam. Historically, this canyon's first organized land use was grazing by early ranching settlements in Emery County.

Both federal land agencies, Bureau of Land Management and the US Forest Service, have active grazing units within the permit area.

Currently on the BLM lands in the permit area the livestock use

is spring grazing with cattle on the benches (April 1- June 10). The Wilberg and West Huntington allotments are stocked at 27.0 acres/AUM and 16 acres/AUM for a total of 190 and 1,074 AUM's respectively. These allotments are judged in poor condition with a downward trend (BLM files).

Very little grazing by cattle occurs on the steep slopes above the benches because of the difficult access and scarcity of forage.

The grazing of the USFS lands is confined to East Mountain under an approved rest rotation system (USFS, 1979). Nine permittees graze 486 cattle from June 21 to September 10 for a total of 1,296 AUM's. The range condition is judged good with a static to upward trend. The stocking rate is 11 acres/AUM.

Elk and deer use East Mountain for summer range but winter on the slopes surrounding the plateau. These ranges are rated as high priority summer and critical winter range for both species by Utah Division of Wildlife Resources.

The total forage productivity of the pinyon-juniper range on the benches is 100-324 lbs/acre, dry weight. The pinyon-juniper range on the rockland soils of the steep slopes is lower, estimated at 25-100 lbs/acre, dry weight. The mixed conifer range productivity is 167-290 lbs/acre, dry weight.

The BLM also recognizes the sand and gravel resources on these benches and has designated specific areas for excavation and processing to aid in community expansion. The BLM visual resource management system rates the benches as Class IV and the cliff faces as Class III. Both of these classifications allow for modification of the land through man's activities. The USFS also rates the south end of East Mountain as modification or partial retention, a scenic value similar to BLM's Class IV

and III respectively.

The Land Use Plan for the Wasatch Plateau designates no recreation development, or timber sales on East Mountain but does specify the improvements of big game range and protection of watersheds. The south end of the mountain is not in a known oil or gas field and the reserve potential is judged low.

The US Forest Service has identified the following uses: big game winter range, mining and mineral developemnt and general rangeland including timber and forage (LRMP 1986).

Premining use of the land was for livestock grazing and wildlife habitat with some occasional timber cutting on top of East Mountain. Land use capability is limited by the steep topography, rocky soils and an intemittent water supply. Other than mining, the highest and best use would remain as grazing and wildlife habitat.

During the early forties, coal was mined within Deer Creek Canyon. Old workings of the American Fuel mine cover about 75 acres and was mined in the Blind Canyon coal seam using room-and-pillar mining methods. About 394,000 tons were removed.

REFERENCES

Bureau of Land Management June 1979, San Rafeal Unit Resource Analysis and Management Framework Plan. Price, Utah.

Emery County Zoning Plat Books. Castle Dale, Utah.

US Forest Service May 1979, Land Management Plan Ferron-Price Planning Unit. Manti-LaSal National Forest. Price, Utah.

Utah Division of Wildlife Resources, May 1982, Utah Big Game Investigations and Management Recommendations 1981-1982. Publication #82-3.

Manti-LaSal National Forest Land and Resource Management Plan 1986.

EMERY COUNTY ZONING

- A-1 Agricultural Zone, contains the primary farming areas of the county.
- RA-1 Residential-Agricultural Zone, this is the area with the communities and the adjacent of intermixed agricultural lands.
- M&G-1 Mining and Grazing Zone, all of the country lands outside the communities, farming area and forest service boundary.
- I-1 Industrial Zone, specific areas near communities and highways reserved for industrial development.
- Ce-1 Critical Environmental Zone, general designation for all private land within the forest boundary.
- Ce-2 Critical Environemtnal Zone, specific designation for certain land parcels especially those adjacent to recreation sites in the forest.

PRIME FARMLAND INVESTIGATION R614-301-221

A prime farmland investigation has been completed by the Soil Conservation Service (see Pages 2-99 and 2-100). The results are similar to those regarding adjacent areas as discussed in the following information.

After investigating all the lands within the permit boundaries of the Deer Creek Coal Mine it is determined that these lands do not qualify as "Prime Farmlands" for the following reasons:

1. Historically the lands prior to construction were not used as crop land.
2. The slopes of and surrounding the protal area exceed 10 percent.
3. There is no developed water supply qualifying as an irrigation source.

Following is a negative determination from the US Soil Conservation Service.



United States
Department of
Agriculture

Soil
Conservation
Service

P. O. Box 11350
Salt Lake City, UT 84147

November 10, 1983

RECEIVED

NOV 10 1983

MINING AND
EXPLORATION

C. E. Shingleton
Director of Permitting,
Compliance and Services
Mining and Exploration
Utah Power & Light Company
P. O. Box 899
Salt Lake City, Utah 84110

Dear Mr. Shingleton:

Keith E. Beardall, District Conservationist, Price, Utah, has handled the field investigation concerning the area described in your letter of November 1, 1983.

According to observations and data collected, there are no prime farmland soils in the sites A, B, and C (designated on the map you furnished). Soils in these sites are too steep or above established irrigation systems which eliminate the soils from the Prime Farmland category.

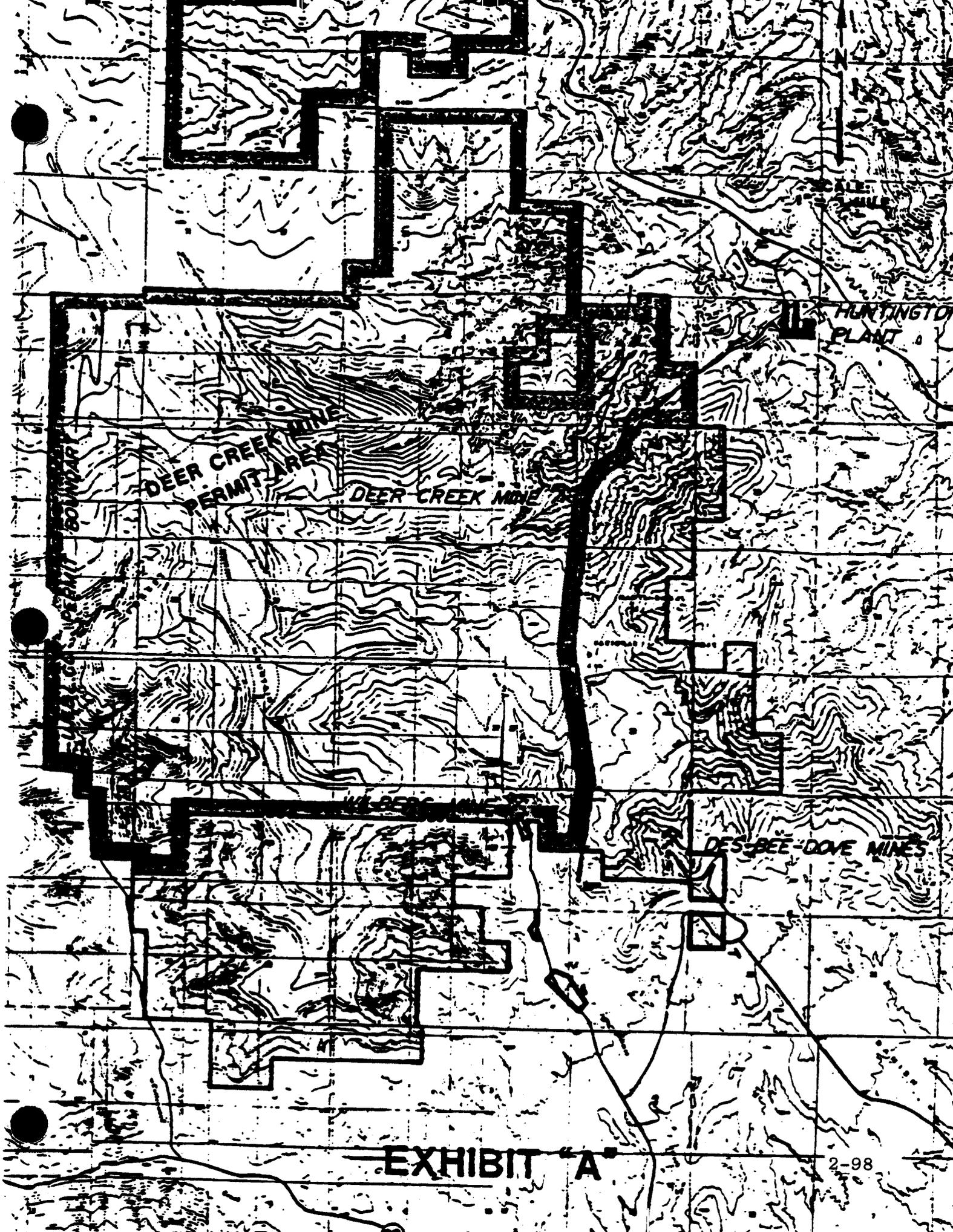
We are retaining the map and your correspondence in this office for future reference. Should you need additional information please call us.

Sincerely,

Ferris Allgood

FERRIS P. ALLGOOD
State Soil Scientist





DEER CREEK MINE
PERMIT AREA
DEER CREEK MINE

HUNTINGTON
PLANT

PERMIT BOUNDARY

DES-BEE-DOVE MINES

EXHIBIT "A"

2-98



United States
Department of
Agriculture

Soil
Conservation
Service

P.O. Box 11350
Salt Lake City, Utah 84147

March 27, 1991

Val Payne
PACIFICORP
324 South State
P.O. Box 26128
Salt Lake City, Utah 84126-0128

Dear Mr. Payne:

In response to your letter dated January 14, 1991, we have made a review of the Project Rilda Canyon Lease Tract in portions of Sections 28, 29 and 33, T16S, R7E; all of sections 31 and 32, T16S, R7E; Section 36, T16S, R6E in Emery County as shown on the map you furnished.

None of these sites contain Important Farmlands for the following reasons: the soils have cryic temperatures (i.e., cold) and the percent slopes times K (an erodibility factor) is greater than 2.

We are enclosing a Form AD-1006 which is needed if federal funds are involved in a project. If you have any questions please call.

Sincerely,

Mike Domeier acting
Ferris P. Allgood
State Soil Scientist

Enclosure

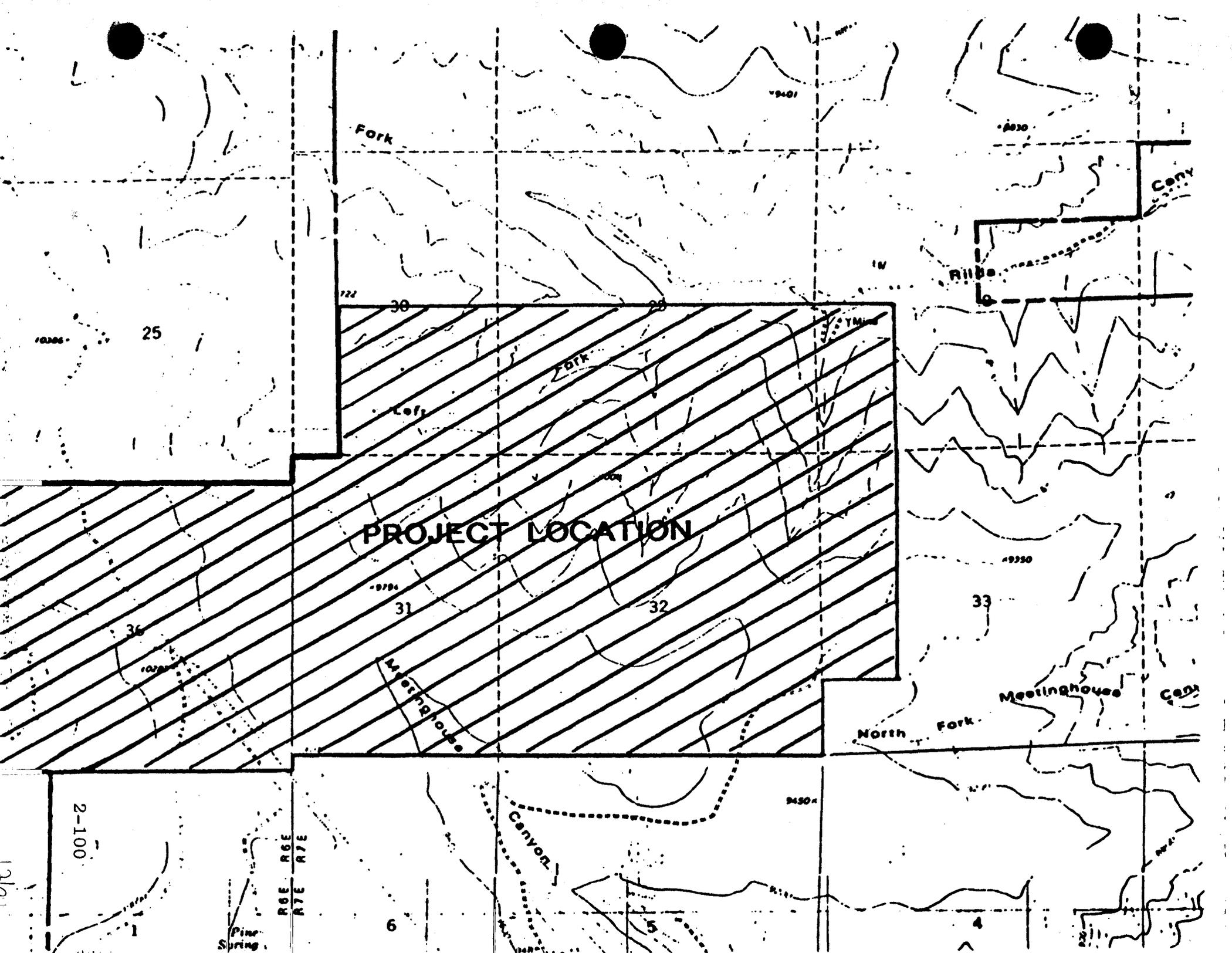
cc:
Leland Sasser, SS, SCS, Price, Utah

2-99



The Soil Conservation Service
is an agency of the
Department of Agriculture

12/91



PROJECT LOCATION

Fork

Ridge

Meetinghouse

North Fork

Canyon

Cany

Cany

2-100

Pine Spring

RGE R6E
R7E R7E

25

22

30

29

31

32

33

36

6

5

4

9400

8800

8950

9450

Y.M.C.A.

DEER CREEK MINE OPERATION

Deer Creek Mine is named for the canyon in which it is located. Private coal mining operations were conducted on fee land in Deer Creek Canyon prior to 1946 when the first federal coal lease was issued in this area. No information is available on tonnage removed.

Peabody Coal Company acquired leases on the Deer Creek property and began operations in 1969. In 1977, Utah Power and Light Company purchased the Peabody operation and leases.

Two minable coal seams exist in the Deer Creek Mine area. Blind Canyon (upper seam is mined mainly from Deer Creek Mine). Hiawatha (lower seam is mined mainly from Cottonwood Mine; however, portions of this seam will be mined by Deer Creek. Both Cottonwood and Deer Creek Mines are owned by PacifiCorp (successor in interest to Utah Power and Light Company).

Relative locations of these two mines are shown on Figure 1.

Deer Creek portal is located in Deer Creek Canyon on the northern end of East Mountain in Emery County, Utah. Mine personnel and coal handling facilities are located there.

Approximately 7196 acres of minable coal are accessible in the Blind Canyon seam from the Deer Creek Mine. Future mining plans include ramping down from the north end of the Deer Creek Mine to the Hiawatha Seam to mine approximately 1810 acres. The anticipated Deer Creek life-of-mine low-ash production is near 91 MM tons. An additional 38 MM tons of high-ash reserves may be recovered when economic conditions warrant establishment of a coal transfer and preparation facility. This anticipated production will be obtained

by utilizing two to three continuous mining units and one to two longwall mining systems. Deer Creek presently operates three continuous mining units and one longwall mining system.

The Deer Creek mining plan has progressively changed with the introduction of more efficient mining methods. The Deer Creek mine is 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 70% of the Deer Creek minable coal reserve will be extracted by longwall mining systems, 30% will be extracted by continuous miner development and limited pillar extraction.

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

MINING PLAN (R614-301-523)

The Deer Creek mining plan is based on the geologic information outlined in Geology Description. Good knowledge of the entire property is available from the outcrop and drilling. Detailed knowledge of a smaller part of the property is known from mining operations.

The mining areas are bounded by natural and imposed limits with varying degrees of confidence as to location and extent:

Lease boundaries - definitely located
and invariable in the short term.

Stratigraphic thinning (pinchout)-
mining limits may vary hundreds of

feet as information becomes available and as mining recovery economics and practicality are studied further.

Faults - may vary somewhat from currently assumed locations.

Underground burned areas - from a practical point of view are indeterminate prior to mining.

Regulatory mining restrictions such as escarpment protection barriers and perennial stream buffer zones.

Permit boundary and approximate locations of faults affecting the Deer Creek Mine plan are illustrated in Figure 1. Faults influencing the mining plan are the Pleasant Valley Fault, Deer Creek Fault, and Roan's Canyon Fault.

Mining limits in the Blind Canyon and Hiawatha Seam include the 5 foot seam thickness. The underground mining machines now employed in the Deer Creek Mine are, by design, limited to a 5 foot coal seam. The Blind Canyon 5 foot thickness limit is present in the southern area of the Deer Creek Mine and the western area of the north reserves accessed through the Roan's Canyon Fault.

The interburden in the minable area where the two seams overlap averages about 80 feet. Mining will commence in interburden thickness of 30 feet or greater when extracting both seams.

Since part of the area of the Cottonwood Mine is overlain by areas of the Deer Creek Mine, detailed mine scheduling has been undertaken to ensure that the upper seam is mined prior to the mining of the lower seam while still following good mining practices in generating the mine layout. In addition, the mining plans are designed with a system of barriers for protection of the 345 KV transmission line.

The mine layout, as illustrated in Maps 3-1 thru 3-3, 3-6 and 3-7 is 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. Better knowledge of the geology and quality parameters of the coal reserve through additional drilling, mine development work, and continued operating experience at Huntington Power Plant will influence future mining techniques and mine plans.

The planned mine development sequence accommodates longwall panels as the primary means of efficiently extracting the reserves. Longwall mining systems are far superior to other mining methods in terms of overall coal recovery, safety, consistent coal quality, and operational efficiency. In areas of the mine where overburden, coal quality, or ground conditions are a concern, only longwall systems will be employed to extract the reserves. This will ensure the best possible means of maximizing reserve recovery while maintaining consistent coal quality and ground control.

The sequence of mining at Deer Creek is shown on Maps 3-1 thru 3-3, 3-6 and 3-7.

Plans for roof control, ventilation system, and methane and dust control have been submitted to MSHA and are filed in the MSHA district office; Mine Safety and Health Administration, P. O. Box. 25367, Denver, Colorado 80225.

Two breakouts in the North Fork of Meetinghouse Canyon have been established for mine ventilation airways. As required by MSHA, these portals will be designated as emergency escapeways and, therefore, require access from the portals into the canyon. If, in the case of an emergency which would cut off all other routes of escape and these portals were used, the personnel could make their way to the canyon floor on foot.

Each of the two portals is approximately eight feet high and twenty feet wide with horizontal separation of one hundred feet between centers. Each portal is fenced to prevent entry and posted with warning signs.

All necessary studies and construction of the North Fork Meetinghouse Canyon breakouts have been completed.

The coal seams at this location strike in a north-south direction and dip to the west at 1.3 degrees. Because of this fact, any water produced near the portal would flow downdip into the mine rather than flowing out of the mine. Berms has been installed at the portals for additional protection.

These breakout portals will be sealed upon abandonment of the Deer Creek Mine.

The portal seals will consist of double wide concrete block wall backfilled with non-combustible material, sloped to match that of the existing canyon slope. Again, all work will be performed from within the mine and nothing in the way of coal, rock, or waste materials will be pushed down the canyon.

MINING METHOD

Continuous Mining Units

The principle purpose for continuous mining units in Deer

Creek Mine is development; i.e., driving main entries, opening headgates, tailgates, bleeder and setup entries for the longwall panels.

Figure 2 illustrates the basic configuration of the main entries. A six-entry system is planned for the main headings with openings driven 20 feet wide on 100 foot centers. The pillars created thereby measure 60 feet by 80 feet, a size which, has been recently developed for sufficient support of the overlying strata and mine entries.

Development work for the longwall panels is illustrated in Figure 3. Headgates and tailgates are being driven with two-entry systems on 50 foot by 105 foot centers. Bleeder entries are driven on 50' widths by 100' long centers. With retreating longwall mining systems, all development work is accomplished by continuous mining units prior to longwall equipment installation.

In those areas where longwall mining is not practicable and economic conditions are favorable, room-and-pillar sections may be developed as production sections for continuous mining units. For development of room-and-pillar sections at Deer Creek Mine, five entries will be opened on advance with two or more developed on retreat in conjunction with pillar extracting. Openings are 20 feet wide on 50 foot by 100 foot centers. The sequence of pillar recovery is shown in Figure 4 (near the end of advance and beginning of retreat and pillaring).

However, the predominant mining method will be the longwall mining system which achieves much higher recovery percentages.

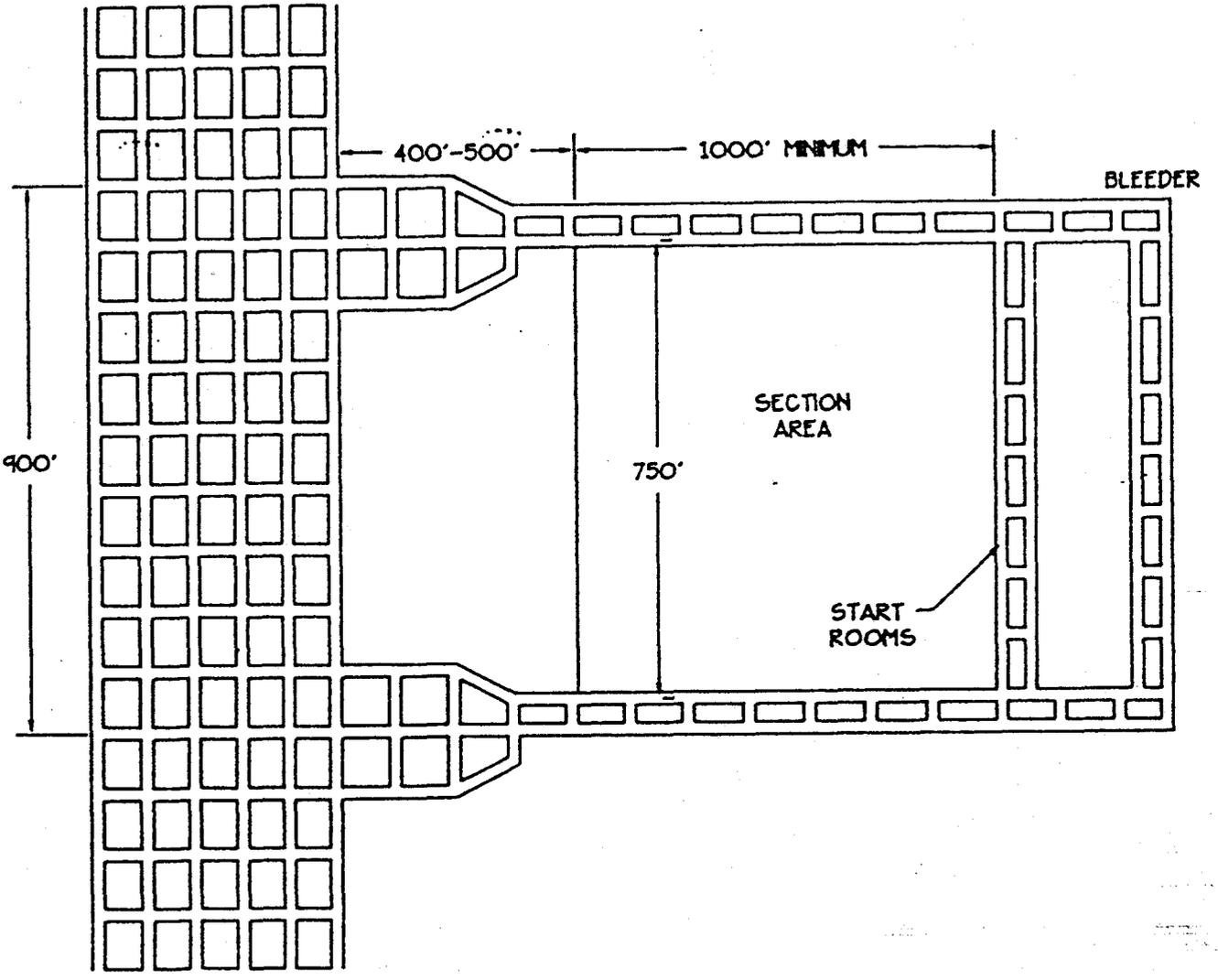


FIGURE 2
 CONFIGURATION OF EXTRACTION
 SCALE: 1"=300'

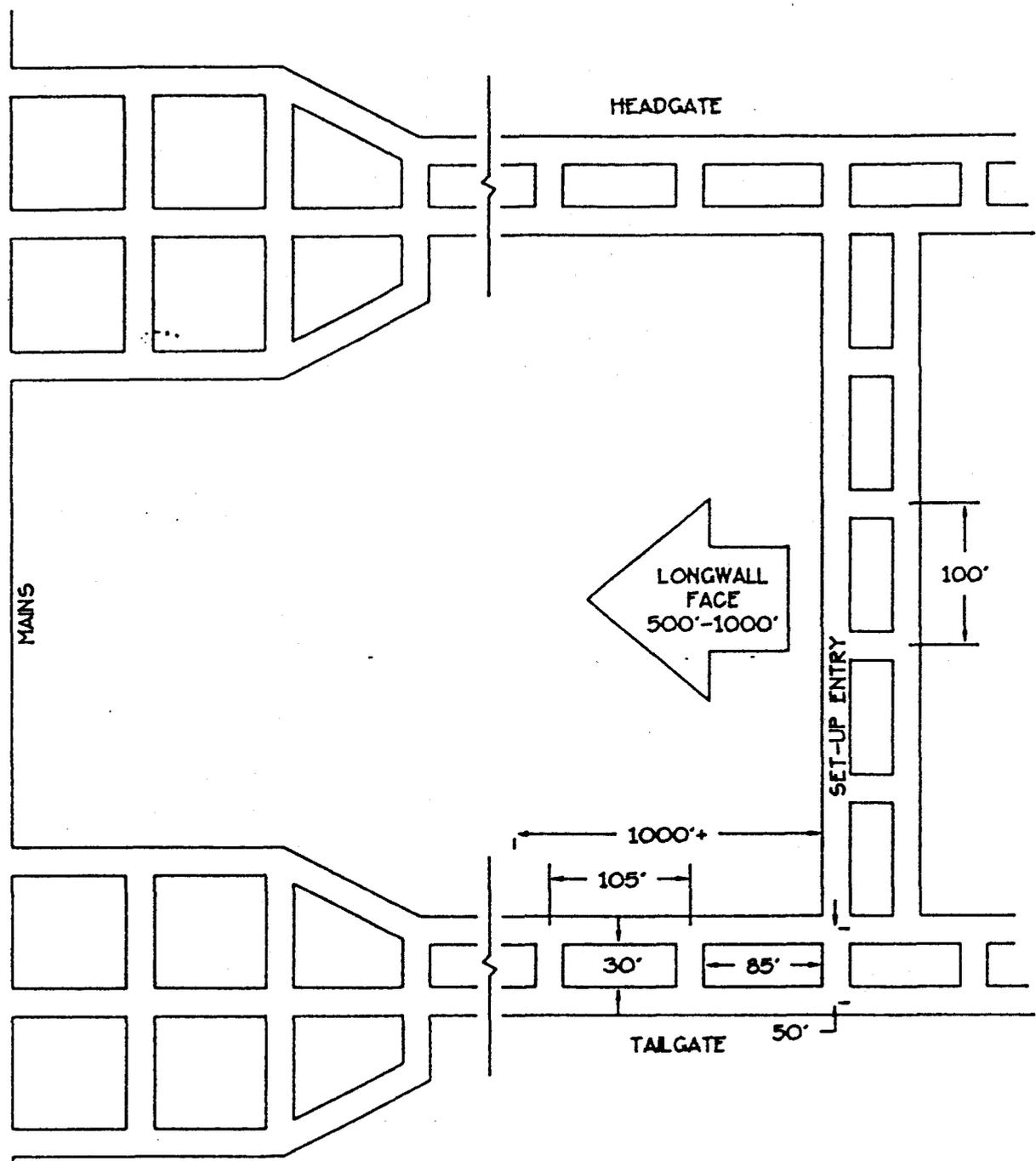
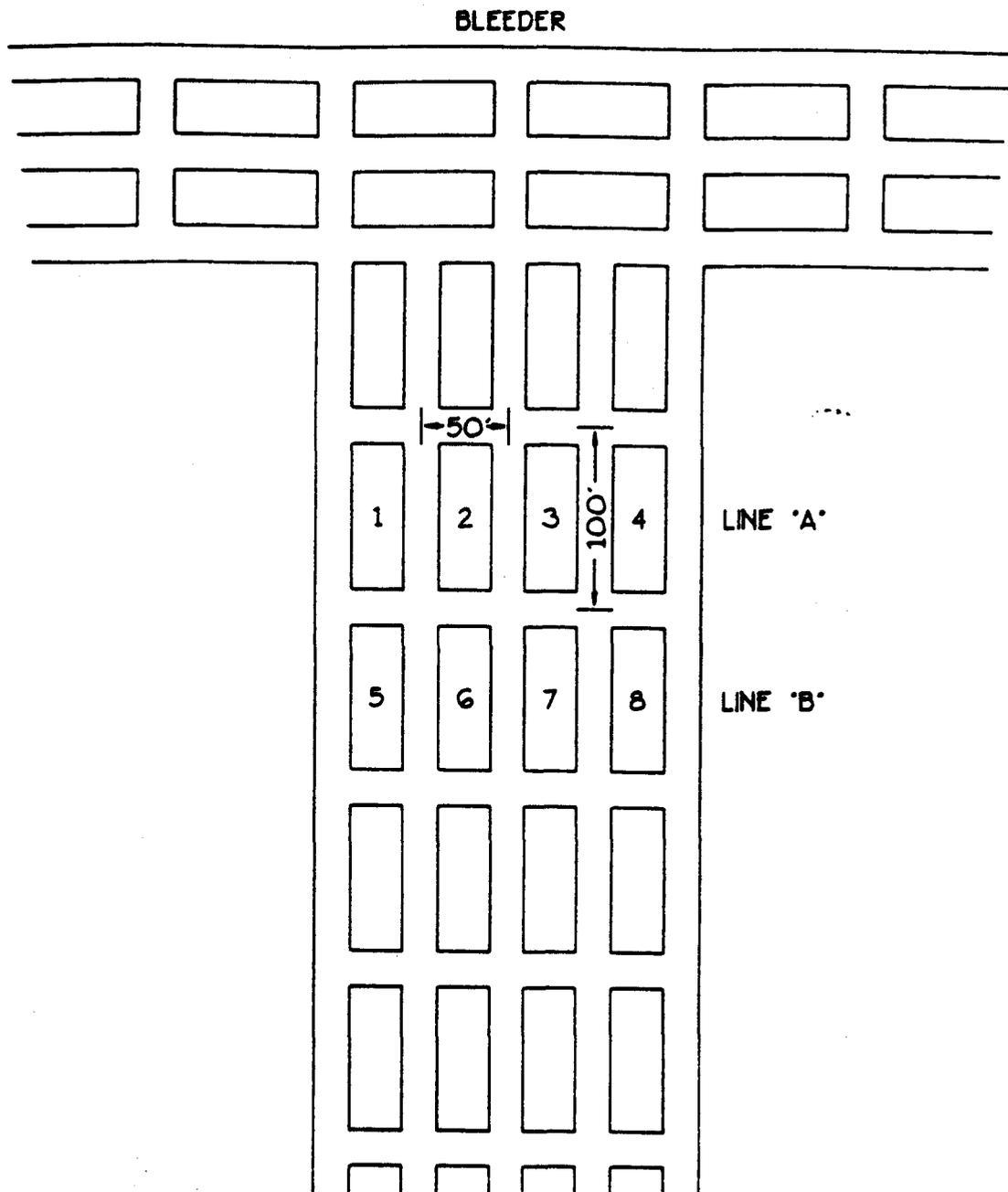


FIGURE 3
 LONGWALL PANEL AS USED IN
 DEER CREEK COAL MINE
 SCALE: 1"=120'



PILLARS IN LINE 'A' WILL BE RECOVERED FIRST,
 STARTING AT PILLAR #1 GOING TO #4. THEN
 THE PILLARS IN LINE 'B' WILL BE RECOVERED.

FIGURE 4

SEQUENCE OF PILLAR RECOVERY

SCALE: 1"=100'

Longwall Mining Systems

Longwall coal mining as it is practiced in applicant's mines presents the safest and most efficient mining method that is available.

The longwall method used is the retreating type. After development entries are driven to the extent of the panel length on both sides of the longwall face, setup entries are driven to connect the development entries. A mining face, 500 to 1000 feet wide (depending on circumstances) is developed, and the longwall equipment installed. Mining then proceeds back towards the main entries. A barrier of approximately 400 to 500 feet is left between the mined out longwall panel and the main entries.

Panels are designed with two-entry development systems on 50 foot by 105 foot centers. Entries are developed on 100 foot centers for at least two pillars before they are decreased to the 50 foot by 105 foot centers. The 50 foot by 105 foot centers on development entries are designed on the yielding pillar principle. This means they will gradually crush out as the second longwall panel mines by them. The purpose of this feature is to prevent the buildup of unrelieved stresses in the pillar which, in the past, has resulted in sudden and violent failure of pillars with its accompanying danger to personnel and property.

The longwall panels are designed to be as long as possible within the property boundaries. Geologic features are the principal limiting factors.

Due to the time involved in moving a longwall mining system, the minimum panel length considered is 1500 feet.

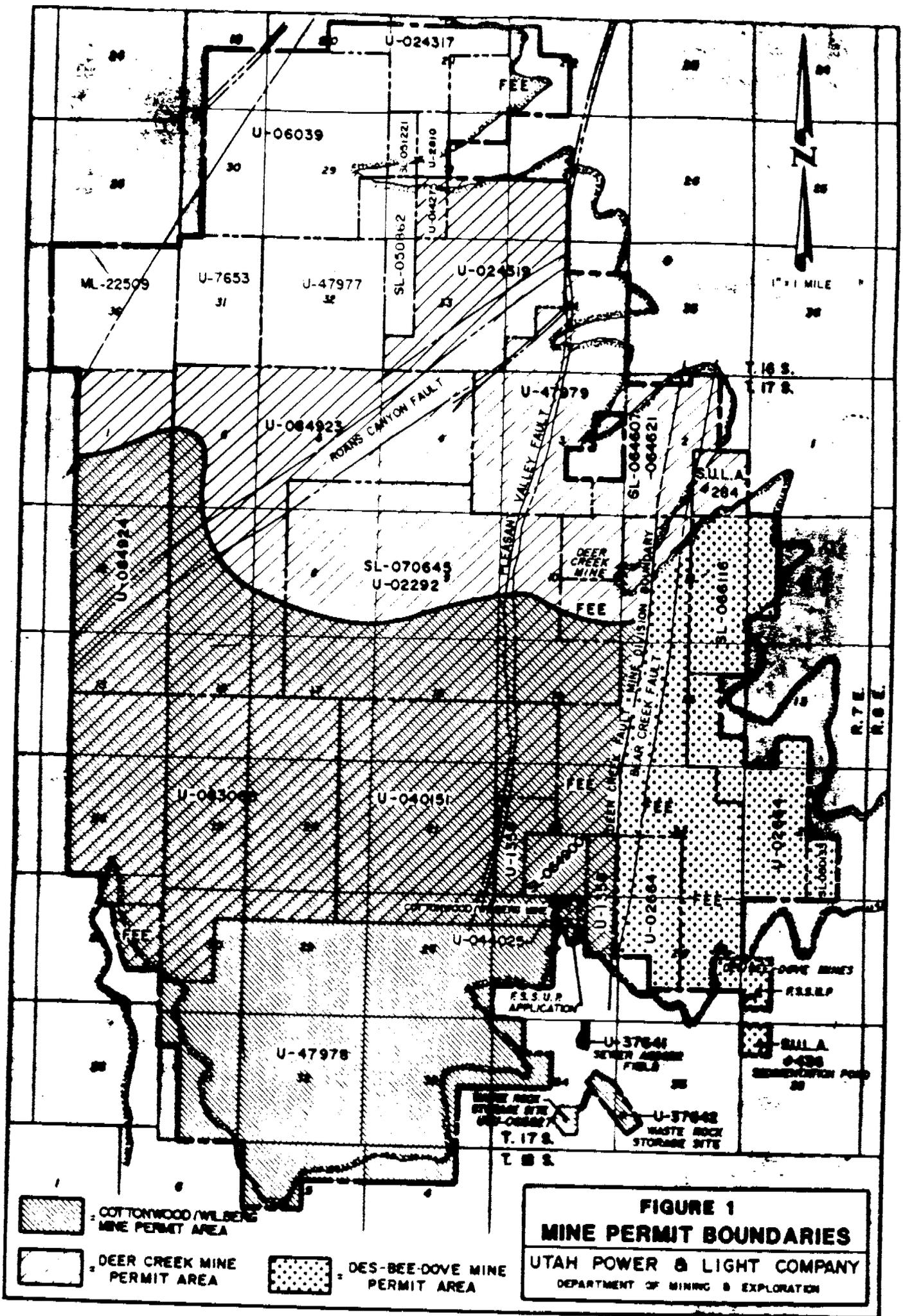


FIGURE 1
MINE PERMIT BOUNDARIES
 UTAH POWER & LIGHT COMPANY
 DEPARTMENT OF MINING & EXPLORATION

Coal Recovery

A maximum amount of economically recoverable coal will be extracted from this mine with the exception of protective coal, which must be left in place to ensure the integrity of the mine. This protective coal can be broken into two separate categories of barrier coal and strata control coal.

One hundred (100) foot wide barrier pillars are left between room-and-pillar panels to prevent abutment pressures from adjacent sections from carrying over to the active section. These barrier pillars also act as fire isolation barriers, should a combustible incident arise in any particular panel.

Barriers either 300 feet or 400 feet wide are left between major room-and-pillar panels. Barriers from 400 to 500 feet are left between longwall extracting panels and the main entries in the mine. These major pillars protect the main entries, which contain the intake and return airways, and transportation systems, during mining in the particular area of the mine that these entries serve.

Strata control coal is left in areas where the floor or roof rock is unstable and subject to failure. This coal will be left as a safety measure, during the development of the section, and will be extracted during the retreat of the section if safely possible.

As is the case with both standard systems of mining for Deer Creek Mine, it is the intention of the applicant to maximize the amount of coal recovered from lease areas, subject only to feasible economic constraints, coal quality and mine safety considerations.

It is anticipated that occasions will arise when resource recovery cannot be fully accomplished as outlined by the mine plan, due to difficult mining conditions, unforeseen geologic conditions, regulatory restrictions, or degradation of the minable coal quality. However, before any modification is made, it will first be discussed with the appropriate BLM officials for approval.

Abandonment of the coal mine will be accomplished by a series of systematic sealings of worked out areas within the mine. As each section of the mine is extracted, the gob area left behind will be sealed off from the mine atmosphere by constructing seals. These seals will be constructed in accordance with MSHA regulations.

Within the area of the Wasatch Plateau, coal seams are known to be present in two formations, the Blackhawk and the Ferron Sandstone member of the Mancos Shale. Coal seams within the Ferron Sandstone outcrop to the southeast and are of economic importance in that region (Emery Coal Field). However, the presence of these seams at depth below East Mountain can only be speculated because no data is available to prove their existence. If coal seams do exist in the Ferron Sandstone they would be at presently unminable depths of 4,000 to 4,500 feet below the Deer Creek Mine workings. The future recovery of these speculative coal reserves will, in no way, be influenced by the present or proposed workings of the Deer Creek Mine.

Table 3 identifies the number of acres affected by mining for each five year period. In areas of seam overlap, only the first mining in the area is considered in calculation of acreages. Subsequent mining in the other seam is not considered since the area has previously been affected.

TABLE 3

Acres Affected by Mining

<u>Period</u>	<u>Low-Ash # Acres</u>
1990	97
1991 - 1995	1329
1996 - 2000	1027
2001 - 2005	809
2006 - 2010	575
2011 - 2015	401
2016 - 2017	<u>422</u>
TOTAL LOW-ASH ACRES	4660
ADDITIONAL HIGH-ASH ACRES	<u>2536</u>
TOTAL	7196

MINE PRODUCTION

It is expected that the increasing emphasis on production sections as opposed to development sections, an average production rate of 650 tons/machine shift for continuous miners and 6200 tons/machine shift for longwalls is deemed attainable in the future. Table 4 lists the anticipated annual and total production of coal at Deer Creek Mine.

A year's production of the longwall can change from year-to-year because of the long length of time required to move the longwall equipment when a panel is completed. A longwall move can take up to a month's time to complete. Several moves may occur during the same calendar year depending on longwall panel length.

It is expected that recovery rates of 80% can be obtained within the longwall panels. The estimated overall minable reserve recovery for Deer Creek Mine is 60%.

TABLE 4
DEER CREEK MINE
ANTICIPATED ANNUAL AND TOTAL PRODUCTION

<u>YEAR</u>	<u>TONS</u>	<u>YEAR</u>	<u>TONS</u>
1990	2,966,000	2005	3,691,000
1991	3,156,000	2006	3,691,000
1992	3,578,000	2007	3,691,000
1993	3,567,000	2008	3,448,000
1994	3,673,000	2009	3,448,000
1995	3,673,000	2010	3,567,000
1996	3,704,000	2011	3,570,000
1997	3,703,000	2012	3,570,000
1998	3,691,000	2013	3,562,000
1999	3,566,000	2014	2,652,000
2000	3,567,000	2015	2,525,000
2001	3,691,000	2016	2,364,000
2002	3,691,000	2017	464,000
2003	3,564,000		
2004	3,316,000		
		TOTAL LOW-ASH TONS	91,585,000

The sequence of developing panels is dependent upon production requirements, mining efficiency, and geologic parameters of the coal deposit. Coal requirements are based on a planned annual production rate of 3.0 to 3.7 MM tons for the mine. Total recoverable reserves within the Deer Creek Mine's boundaries are 123 MM tons (this includes 35 MM high-ash tons in the Blind Canyon and Hiawatha Seam). As noted previously, a mining productivity of 650 tons/continuous miner shift and 6200 tons/longwall shift is eventually attainable. This translates into three miner sections and one longwall section operation 2 shifts/day, 234 days/year in order to achieve the required coal output at full production. Deer Creek Mine will eventually transfer up to 1,000,000 tons per year via a coal transfer raise to the Cottonwood coal handling system.

All in-mine coal haulage is by belt conveyor. Of the total entries in the main entry systems, at least one entry is dedicated specifically to the belt conveyor. All men and materials are transported underground by diesel equipment.

Table 5 lists the major ancillary equipment used in Deer Creek Mine.

TABLE 5

DEER CREEK MINE - MAJOR UNDERGROUND ANCILLARY EQUIPMENT

<u>Continuous Mining Units</u>	<u>Longwall Mining Systems</u>	<u>General Mine</u>
4 - Continuous Miners	2 - Face conveyors	2 - Locomotives
7 - Shuttle Cars	2 - Double Ended Shearers	16 - Compressors
6 - Scoops	278 - Shield Type Supports	23 - Transformers
6 - Roof Bolters	2 - Stageloaders	21 - 48" Conveyors
32 - Rock Dusters	2 - Lump Breakers	36,400' - 48" Conveyors
4 - Power Centers	4 - Shield Movers	6,450' - 60" Conveyors
8 - Feeder Breakers	2 - Transformers	17 - Welders
	1 - Petito Mule	8 - Battery Chargers
		10 - Material and Equipment Trailers
		5 - Diesel Scoops
		41 - Isuzu Pickups
		1 - Road Grader
		1 - Dozer
		2 - 60" Drives
		4 - Diesel Mantrips
		4 - Diesel Tow Vehicles

ENGINEERING PRINCIPLES AND TECHNIQUES

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 practice. Employment of knowledgeable, experienced personnel makes application of such principles possible. Engineering design techniques for Deer Creek Mine include computer simulation of coal extraction, ventilation, roof control, subsidence, equipment performance, and pumping systems, along with materials testing for rock mechanics and subsidence parameters.

Long-range mine planning by computer simulation plays an important role in design. Computer simulation of coal extraction assists the engineers in projecting annual tonnages and sequencing extraction in panels and sections. Computer based long-range planning helps to maximize annual production and better utilize continuous mining units and longwall mining systems. The two-seam nature of the property and consequent need to extract upper seam panels and sections increases the value of these simulations.

Ventilation and dust suppression are essential in underground mining operations. Delivering air and water from their respective sources to fulfill these needs can become complicated in a large operation. Simulations of ventilation and hydraulic networks play a significant role in planning for future needs and installing systems for delivery. Deer Creek Mine planning includes these ventilation and hydraulics simulations.

Computer assisted rock mechanics and roof control studies are a necessary part of mine planning. The long-term stability of the entries directly affects mine integrity as well as a protection

of property and mine production. Because of the areal extent of the Deer Creek property, mine integrity must be maintained for extended periods up to 50 years. Rock mechanics studies have been extensive, with applicant conducting several in-house and outside evaluations and participating in ongoing cooperative projects with the U.S. Bureau of Mines.

The determination of rock strength, entry stress distribution, abutment loads, and roof support design have been consistently studied. Holes are drilled downward or upward from existing Deer Creek entries within the mine to determine coal quality mine roof, and interburden characteristics. This data is continually processed to aid in efficient design of the Deer Creek mining layouts.

The operator commits to sample roof, floor and midseam material in active sections annually. A representative sample will be taken in areas mined within a given year. The locations where the samples are taken will be sufficient to include the various lithologies encountered during mining. These locations will be plotted on a map for future reference. The samples will be analyzed for acid-and/or toxic-forming potential in accordance with the Divisions Guidelines for the Management of Topsoil and Overburden. The sample location map and laboratory analyses, including raw data, will be submitted to the Division annually.

SUBSIDENCE CONTROL PLAN (R614-301-525.100)

This section describes in detail the Applicant's plan to ensure minimal environmental impacts from mine-induced subsidence. The Operation Plan plus the Geology Section 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 resultant of the proposed mining operations.

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 Deer Creek, Des Bee Dove and Cottonwood mining activities. 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. The water seeps and springs are numerous and varied in nature. 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. Many of the springs feed water troughs maintained for livestock and wildlife. The occurrence of the springs is discussed in the hydrology section and no further discussion will take place here; however, data collected suggest that the springs on the surface will not be affected by the subsidence.

Several small wood frame cabins are present within the

permit area. A survey of the cabins was made and submitted as part of the Deer Creek permit application. It is believed that the subsidence will not have any effect on the cabins within the area.

There are no oil, gas or water wells located within the East Mountain property, nor are there any gas or oil pipelines. One 345 KV power line crosses the property. The line will be protected from subsidence by a barrier of coal which will remain unmined.

Mining Method

Applicant intends to minimize surface effects of subsidence by adopting, wherever practical, the longwall method of mining 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 order to extract the maximum possible amount of the coal reserve. Approximately seventy percent (70%) of the coal reserve will be mined by the longwall method, the remaining area by continuous miner. No area within the mine limits is planned to remain unmined. Determination of the mineability of some areas associated with escarpments is pending further technical analysis. (See Maps 3-3, 3-6 and 3-7.)

The longwall mining method allows almost total extraction of the mineral and induces caving of the immediate and upper roof strata. The caving process propagates upward to a horizon located at a distance equal to approximately thirty-five

to fifty times the mining height over the coal seam as indicated by the data in Figure 1. The curve in the figure shows the elongation of a borehole due to caving of the overburden over a longwall panel. (from Dahl and Von Schonfeldt).

The differential settlement of the overburden was normalized by dividing it by the seam thickness. As can be seen, the deformation decreases from a maximum of one (1) at the seam roof to near zero (0) at approximately thirty-seven (37) times the mining height above the coal seam. The deformation or deflection above this horizon is essentially continuous; the upper strata settles down on the gob without any further increase in volume (porosity).

A similar conclusion was reached by Orchard in 1973 and is illustrated in Figures 2 and 3.

It is applicant's intent to mine areas as wide and long as present mining technology 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 normal coal pillars used in mine planning for both the Blind Canyon and Hiawatha seams to ensure stability has been determined by basic calculation for the deepest expected cover (from prior mining practice in the area) and USBM study (Pariseau). Experience has also shown that, in

multi-seam mining circumstance, columnizing main development pillars in both seams is essential for main stability.

The mine plan indicates that only first mining, i.e., forming pillars only, will protect high voltage power line structures from any possible subsidence. Barrier size for this essential protection has been devised from data obtained from ongoing subsidence monitoring survey (USBM Algire) on East Mountain.

Full extraction areas (room-and-pillar panels with pillar removal and longwall panels) are, by definition, planned and controlled subsidence 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 mineable seams will not exceed twenty (20) feet.

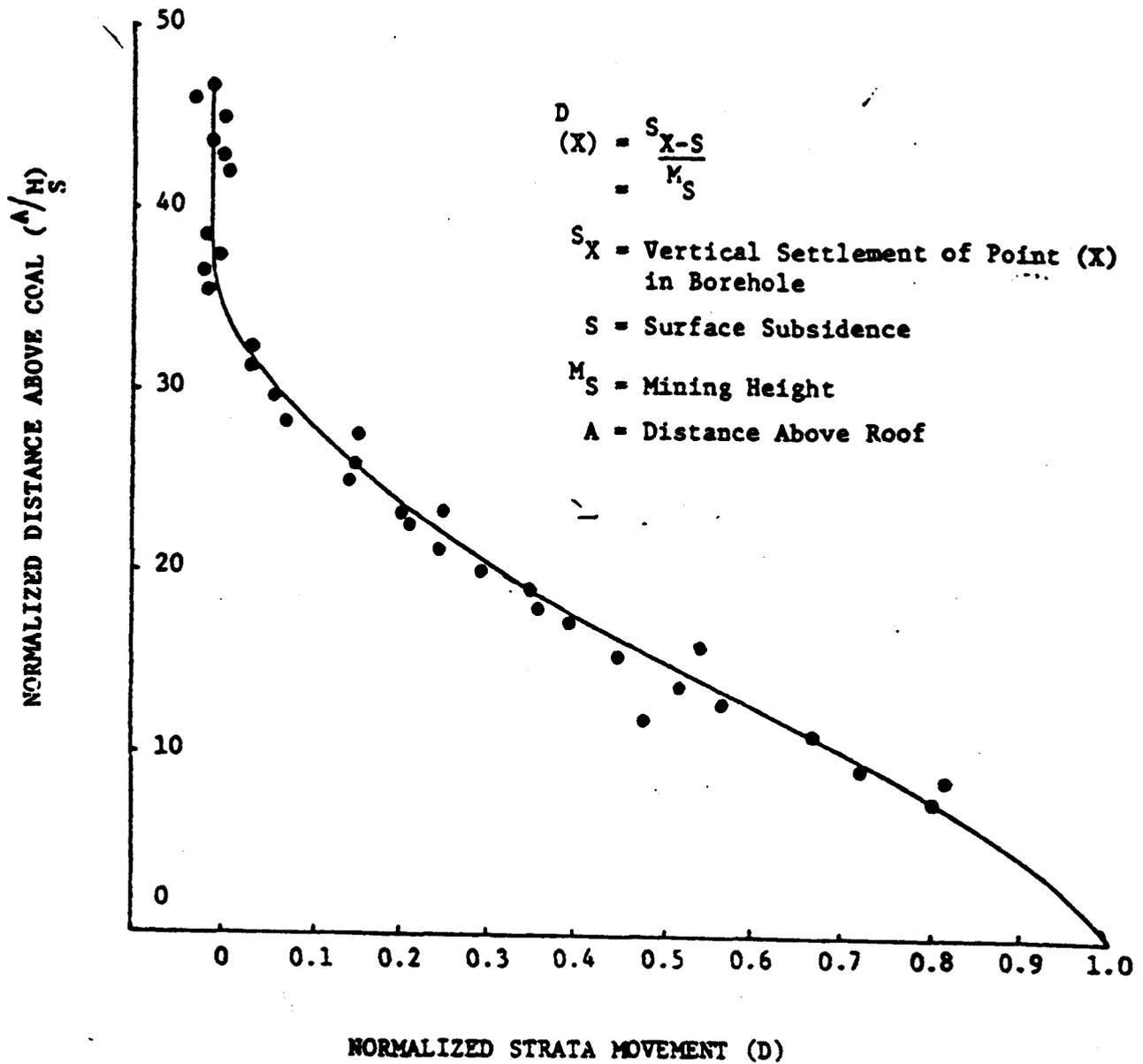


FIG. 1. Vertical settlement of overburden above a longwall panel (after Dahl and Von Schonfeldt)

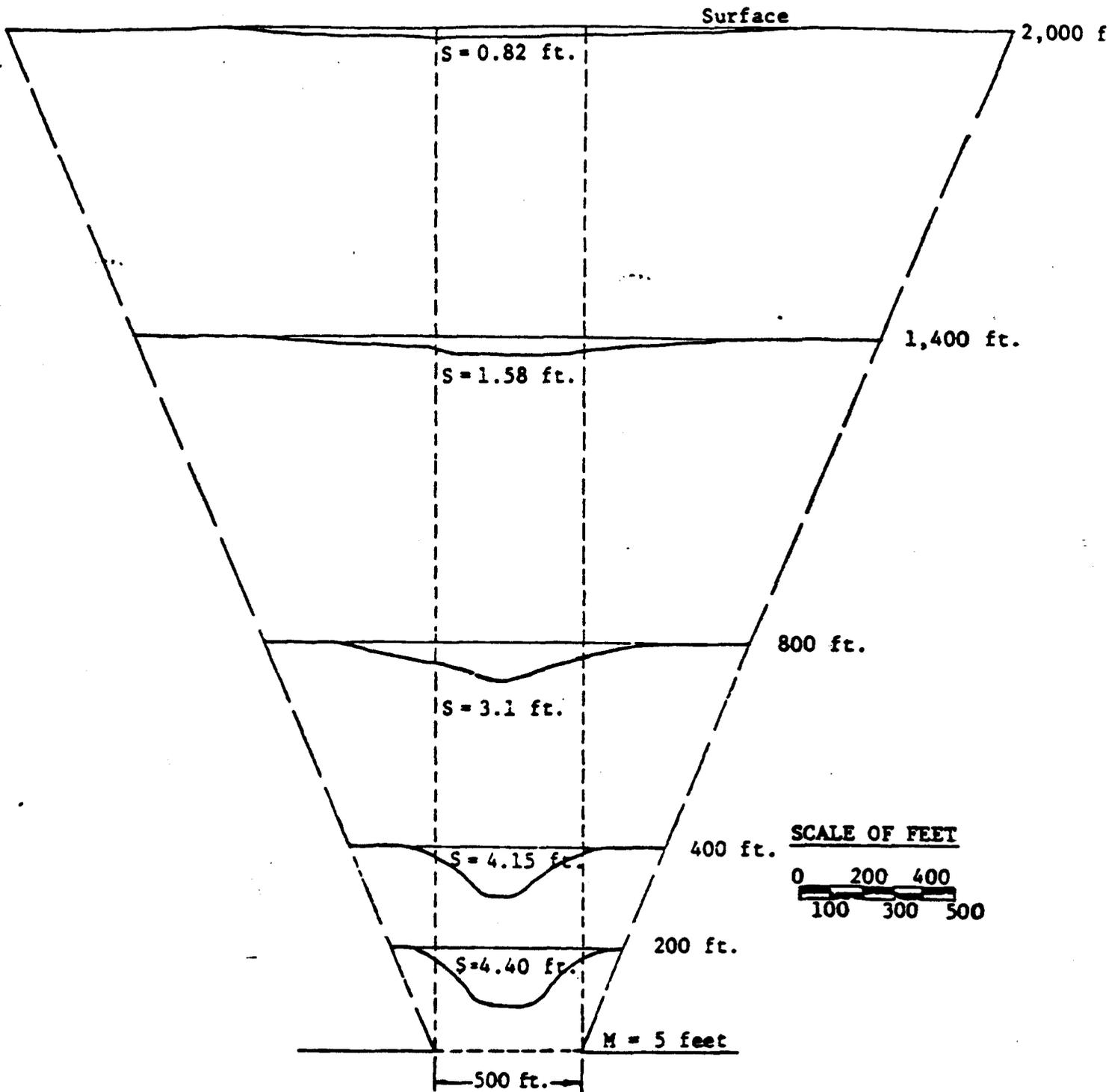


FIG.2. Varying subsidence profile at different horizons.

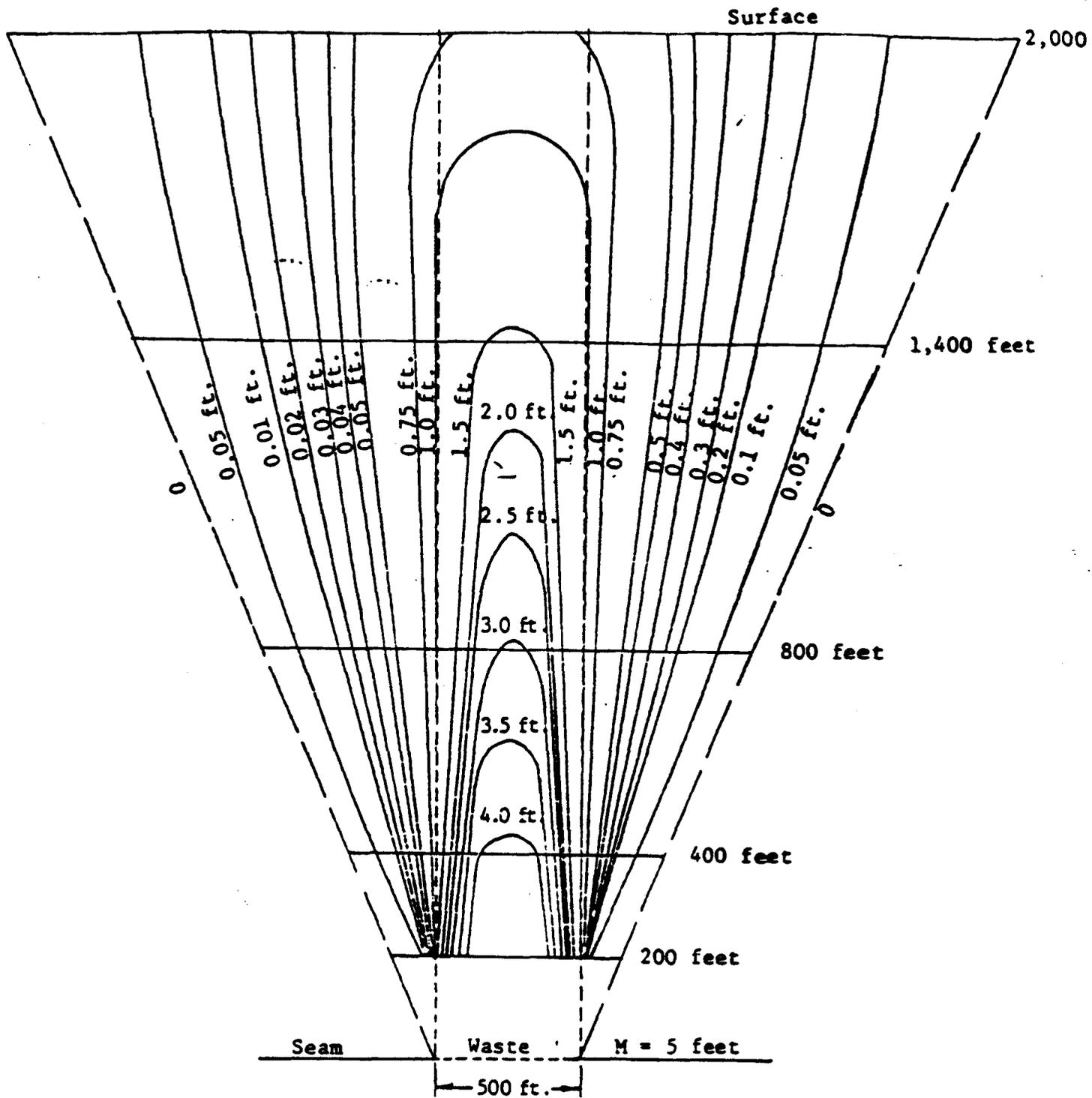


FIG. 3. Lines joining points of equal subsidence.

SUBSIDENCE MONITORING PLAN

Applicant 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 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 Division, applicant 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 allow applicant 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 Division's office.

AERIAL PHOTOGRAMMETRY

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 applicant shall conduct annually an

aerial photo survey of all areas which have been undermined. Elevations of control points within the photos will be determined by photogrammetric means to an accuracy of ± 1 foot and compared to corresponding elevations derived from the baseline survey conducted in August 1980. The applicant shall continue monitoring all areas undermined until it is mutually agreed by the applicant and the Division 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 the Division annually in a summary report.

Special Monitoring

The applicant is presently monitoring and shall continue to monitor the subsidence in areas of the Castlegate Cliff using on-the-ground survey prisms which will allow the determination of both horizontal and vertical movement along the cliff. Monitoring shall continue until it has been shown that the cliff is stable and no further movement is anticipated.

The applicant shall also use all available data, including lithologic, fracturing and jointing of the strata, and rock mechanics data, to develop a predictive model of the stability of the cliff to be undermined. The model shall be used to forecast anticipated effects when mining progresses under the cliffs in the various areas. Mineability of some areas associated with the escarpment will be determined based upon the model.

MITIGATION OF SUBSIDENCE DAMAGE EFFECTS

Should material damage be incurred by a cabin despite the planned subsidence damage prevention measures, the applicant will repair the damage caused by subsidence resulting from the applicant's activities or will compensate the owner of the cabin for such damage.

Any roads, fences, stock ponds, earth dams, or water troughs which are materially damaged by subsidence will be repaired and regraded to restore them to their pre-subsidence usefulness.

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 reasonably foreseeable uses that such lands were capable of supporting before subsidence.

In order to restore any land affected by Applicant's mining operations to a condition capable of supporting the current and postmining 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 postmining land uses as stated herein.

During the course of regular monitoring activities required by the permit, or as the Applicant otherwise acquires

knowledge, the Applicant will advise the Division of the loss or adverse occurrence discussed above, within ten working days of having determined that it has occurred. Within ten working days after the Division notifies Applicant in writing, that it has determined that the water loss is the result of the Applicant's mining operation, the Applicant will meet with the Division 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 the Division, the plan shall be implemented. Applicant reserves the right to appeal the Division'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).

SUBSIDENCE CONTROL

Applicant 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.

PUBLIC NOTICE

Applicant 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 the OSM and the BLM Branch of Solid Minerals 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.

TABLE I

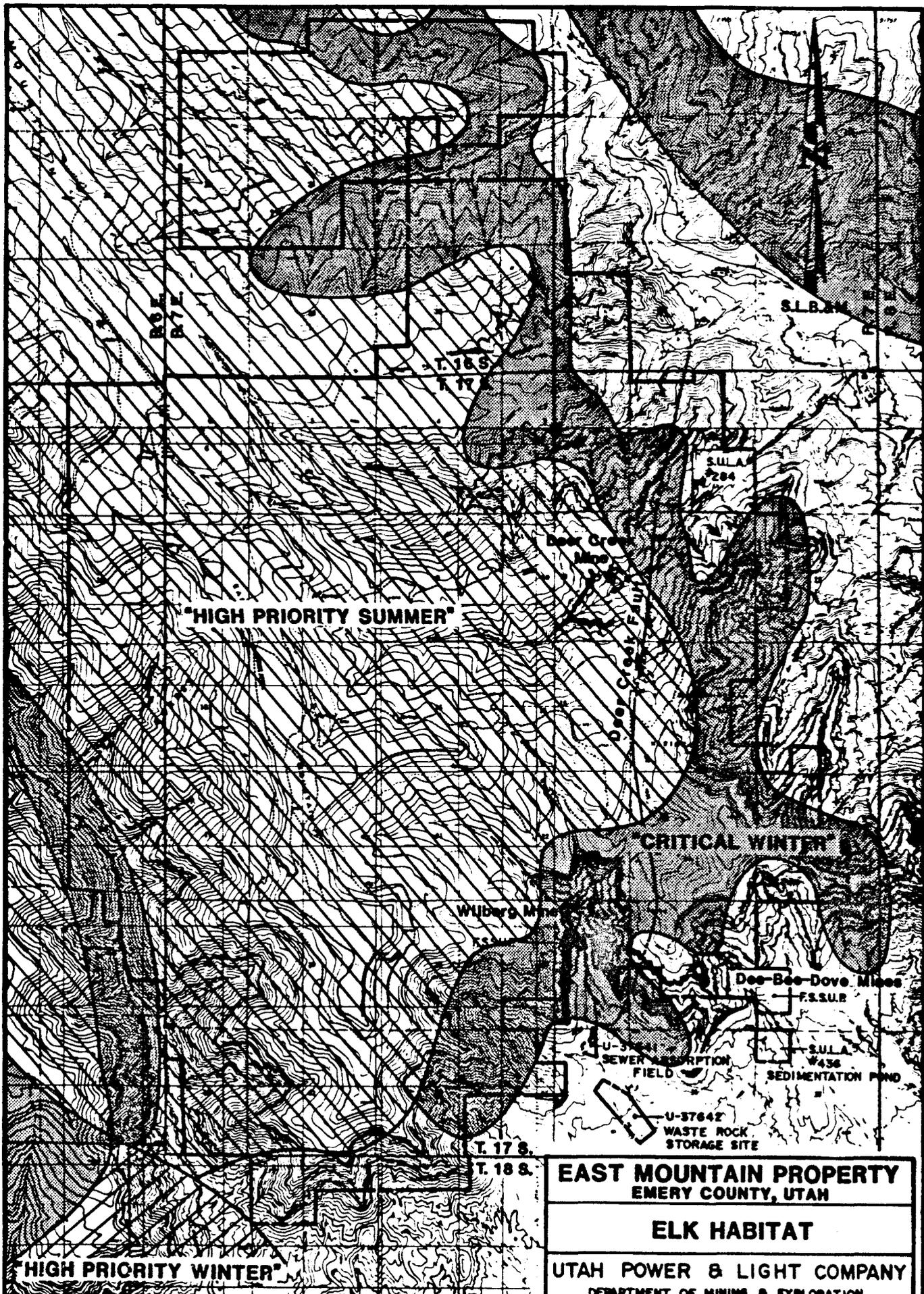
UTAH POWER & LIGHT COMPANY
MINING DIVISION
COTTONWOOD MINE - GOLDEN EAGLE STUDY
(10 Mile Radius Area)
(1986 and 1987 Surveys Conducted by UP&L, UDWR and USFWS)
(1988 Survey Conducted by UP&L and UDWR)

<u>NEST NO.</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
4	Inactive	Tended	Active (2 eggs), Failed
5 A,B	1 Not Found 1 Inactive	2 Inactive	1 Tended 1 Inactive
6	Inactive	Inactive	Tended
7	Not Observed	No Data	Inactive
8	Inactive, Delap.	No Data	Not Found
16 A,B,C,D,E,F	4 Inactive, 1 Tended	5 Inactive, 1 Not Found	Not Observed
17 A,B,C	3 Inactive	3 Inactive	3 Inactive
18 A,B,C	2 Inactive, 1 Tended	2 Tended, 1 Inactive	2 Tended, 1 Inactive
19 A,B	2 Tended	2 Tended	2 Inactive
22 A,B,C	2 Inactive, 1 Not Found	3 Inactive	Not Observed
26 A,B,C,D,E,F	Inactive	5 Inactive, 1 Active- Failed	Not Observed
27 A,B,C,D	3 Inactive, 1 Active (1 Young)	1 Inactive, 2 Tended 1 Active (2 Young)	Not Observed
30 A,B,C,D	2 Inactive, 1 Tended	4 Inactive	Not Observed

<u>NEST NO.</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
34	Not Observed	Inactive	Not Observed
36 A,B	Not Observed	Not Found	Not Observed
37 A,B C	Not Observed	2 Inactive 1 Active (1 Young) Outside 10 Mile Radius	Not Observed
53	Not Found	Not Found	Not Found
54 A,B	Not Found	Not Found	Not Found
55	Inactive	Inactive	Inactive (Adults Observed in Area)
56 A B	Not Observed	Not Found Active (1 Young) (New Nest)	Inactive Tended
57	Inactive	Inactive	Inactive
59 A B	Not Found	Not Found	Tended Old, Delapidated First Observation
61 A,B,C A B C	2 Tended, 1 Inactive	Destroyed (Feb. 1987) Destroyed (Sept. 1987) Active (1 Young Fledged)	Active (1 Young Fledged)
62	Tended	Inactive	Inactive
63 A,B	Not Found	Nest Not Found, Perch Site Only	Not Found
67 A,B,C	1 Active (1 Young), 1 Inactive	3 Inactive	Not Observed
68 A,B	1 Inactive, 1 Tended	2 Inactive	Not Observed

<u>NEST NO.</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
70	Tended	No Data	Not Observed
72 A,B	1 Active (1 Young), 1 Inactive	1 Inactive, 1 No Data	Not Observed
74 A,B,C	Not Observed	No Data	Not Observed
75	Not Observed	No Data	Not Observed
78	Not Observed	No Data	Not Observed
80	Not Observed	Not Data	Not Observed
87 A,E	1 Active (1 Young Fledged)	2 Inactive	1 Inactive, (Old) 1 Active (1 Young Fledged)
B	1 Not Found	Not Found	Not Found
C		Status Unknown (located in October 1987)	Inactive
D		Tended	Tended
88 A	1 Tended	Not found	Tended
B	Inactive	1 Tended	Ravens Present at Nest
C		1 Inactive	Inactive
91	Active (1 Young Fledged)	Active (2 Young Fledged)	Inactive
95	Not Observed	4 SISN	Inactive
97 A,B	Inactive	2 Inactive	2 Inactive
98 A,B,C,D,E	1 Active (Incubating Adult), 4 Inactive	1 Occupied - Failed, 4 Inactive	2 Tended 3 Inactive
99 A,B	Inactive	2 Inactive	Inactive (Only 1 Found)
100	Inactive	Inactive	Tended
103 A,B	Inactive	No Data	1 Active (2 Young Fledged) 1 Tended

<u>NEST NO.</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
107 A,B,C	Inactive	3 Inactive	Not Observed
109 A,B,C	Inactive	3 Inactive	Not Observed
111 A,B	Not Found, 1 Inactive	1 Not Found, 1 Inactive	1 Inactive, 1 Tended
113 A,B	Inactive	1 Inactive, 1 Occupied (Pair Present)	Not Observed
114 A,B,C	Inactive (Only 1 Nest Found)	Inactive	Not Observed
115	Inactive	Inactive	Not Observed
116	Inactive, Old Delap.	Not Found	Not Observed
119	Inactive	Inactive	Not Observed
120	Not Observed	Inactive	Not Observed
121	Not Observed	No Data	Not Observed
123 A,B	Not Observed	No Data	Not Observed
124 A,B,C	Not Observed	No Data	Not Observed
190	Inactive	Inactive	Not Observed
191	Not Observed	No Data	Not Observed
296 A,B,C	3 Inactive, Delap.	3 Inactive, Delap	2 Inactive 1 Tended
SW-1/4 Sec.35 T16S, R8E	1 GE: Active (1 Young Fledged)	2 Inactive, 1 Active - Failed (2 eggs)	Not Observed
Sec. 12 T18S, R7E, A,B	1 Tended	2 Tended (Adults Present)	Not Observed



EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH

ELK HABITAT

UTAH POWER & LIGHT COMPANY
 DEPARTMENT OF MINING & EXPLORATION

DATE: APR. 30, 1984 BY: LINDA J GUM

SCALE: 1" = 1 Mile FIGURE 1

----- = U.P.&L.CO. PERMIT BOUNDARY LINE