0015

COPY

ENERGY WEST Mining Co.

PO Box 310
Huntington, Utah 84528

April 30, 1998

File in:
❑ Confidential
❑ Shelf
☒ Expandable
Refer to Record No 0015 Date 04301998
In C/015/017 Incoming

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

Re: **Amendment to complete the Division Order regarding The Disposition of the Des-Bee-Dove Haul Road, and Postmining Land Use, PacifiCorp, Des-Bee-Dove Mine, ACT/015/017-D097A, Folders #2 and #5, Emery County, Utah.**

Attention: Mr. Daron R. Haddock

Copy Daron, Paul

"Energy West" received the Division's letter dated December 31, 1997, which was a response from the Division to a request for additional time to complete the above amendment (previously submitted in Draft form). The Division granted an extension to April 30, 1998.

At this time "Energy West" submits seven (7) copies of the amendment that covers the requirements necessary to comply with State Regulations. As requested, please find attached, documents that comply with the following items as addressed by the Division in your file letter dated December 12, 1997.

1. **Postmining land use change, documentation to verify publication of premining land use in the local newspaper. (Refer to Land Use Section)**
   - **Energy West submitted a publication draft for review in February (Refer to R645-301-400 Land Use Section). The Division notified Energy West that publication of the Post Land Use Change notification will comence on the date this amendment is sumbitted to the Division. Energy West will submit notice to the Emery County Progress on the week of May 6, 1998. Publication dates are tentatively May 12, 19, 26 and June 2, 1998.**

2. **Documentation from the various land owners providing proof of acceptance of the land transfer and post mining land use change, which includes the following agencies: (Refer to R645-301 -400: Land Use Section)**
   - **School and Institutional Trust Lands Administration**
   - **Bureau of Land Management**
   - **Forest Service**

Huntington Office:
(801) 687-9821
Fax (801) 687-2695
Purchasing Fax (801) 687-9092

Deer Creek Mine:
(801) 381-2317
Fax (801) 381-2285

Cottonwood Mine:
(801) 748-2319
Fax (801) 748-2380

COPY

3. **Documentation from the Emery County Road Department accepting the road transfer and all Rights-of-Ways associated therein. (Refer to R645-301-500: Engineering Section)**

4. **Documentation of funds transferred to the Emery County Road Department from PacifiCorp for upgrading and bringing said road to County Standards as stipulated by the County. (Refer to R645-301-500: Engineering Section)**

5. **PacifiCorp, "Energy West" to show that road runoff will not cause diminution of water quality in the area including erosion control. (Refer to R645-301-700: Hydrology Section)**

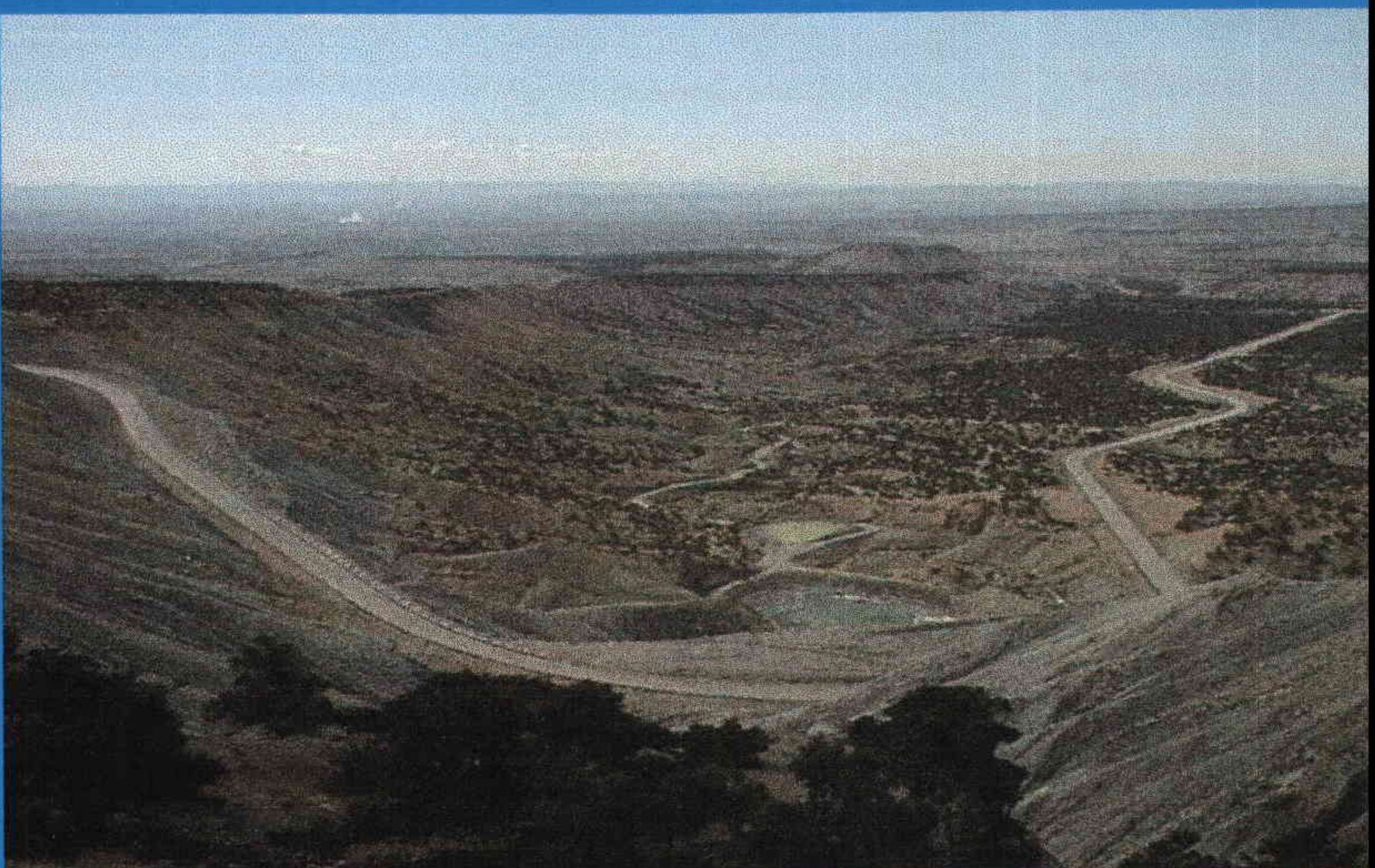
   As previously stated in Energy West's letter dated December 30, 1997, several measures have been provided by Energy West in an effort to maintain and control surface runoff from causing damage or any diminution of the area. These measures have been accepted and approved by the Division and have been monitored during Division inspections for several years. Upon R/W transfer the Emery County Road Department will have full responsibilty to maintain and prevent any possibilities of this nature from occuring. The provisions provided have been (1) a guard rail belting along the inside of the roadway and (2) Rip-rap ditches, water bars and berm protection along the outslope of the steep slope areas. These areas have been monitored and found beneficial and successful in providing the means of erosion control sought by Energy West and the Division. In view of the existing natural surrounding steep slopes, in comparison to those in question the conditions of erosion control are in compliance and well maintained to date.

6. **The reclamation items and bonding review have been revised and are included as part of this amendment to reflect the changes with respect to the removal of all items attached to the haul road transfer. (Items deleted and recalculated, Refer to Bonding Section, Volume 2, Part 4, Reclamation Cost and Reclamation Cost: Calculations & Method).**

After reviewing the MRP and evaluating the changes required within the text and drawings, the following items are determined necessary to realign the permit to comply with those actions taken toward transferring the haul road R/Ws from the Energy West permit to the Emery County Road Department. These items will be revised, removed, deleted or otherwise altered to comply with the regulations that govern the plan.

DES-BEE-DOVE MINES
ACT /015/017

Amendment to Satisfy Division Order (D097A)
Disposition Of The Des-Bee-Dove Haul Road



April 30th, 1998

PacifiCorp

ENERGY WEST Mining Co.

A Subsidiary of Pacificorp

DES-BEE-DOVE COAL MINES

Amendment to Satisfy Division Order (D097A)
Disposition of the Des-Bee-Dove Haul Road

PERMIT No. ACT/015/017-D097A

APRIL 1998

TABLE OF CONTENTS

PAGE

DEER CREEK MAPS AND DRAWINGS

Volume 4

Legal, Financial, Compliance Information

Environmental Resources, Vegetation and Soils

2-1 Thru 2-12 Have been deleted. These Geologic and Hydrologic Data Maps are found in Volume 8 & 9.

Operation Plan

Volume 5

Volume 6

APPENDIX XIV

Des-Bee-Dove/Wilberg Junction Road Plans & Written Text
Hydrologic Calculations for Road Drainage & Culverts (NOV N84-2-22-1)
Rollins, Brown & Gunnell, Inc. - Slope Stability Report, Junction Road Cut Slope at Station 125+00
Engineers Certification - Creamer & Noble Engineers

5-1	Utah Department of Transportation Road Plans (Sheets 1 thru 38)	CM-10584-DS

Volume 7

APPENDIX XIV (Cont.)

5-2	Junction Road Final Reclamation Maps (4 sheets)	CM-10601-DS
5-3	Haul Road - Final Reclamation	CS1130D
5-3A	Haul Road Reclamation - Ditch Design	CS1129C
5-3B	Haul Road Drainage Areas	KS1190C
5-4	Topography Drainage Location Map	CM-10607-DS
	Concrete Collection Box Detail	CM-10608-DS
5-5	Hydrologic Area Drainage Map	CM-10609-DS
5-6	Soil Sample Location Map	CM-10613-DS

APPENDIX XV

Sedimentation Pond Access Road Plans and Written Text

5-7	Detailed Permit Boundary Map Along the Junction Road & Sediment Pond Area	CM-10658-DS
5-8	Sediment Pond Access Road/Plan & Profile (EMC Drawing - 3 sheets)	CS806D
5-9	Sediment Pond Access Road Cross-Sections (EMC Drawing - 2 sheets)	CS805E

APPENDIX XVI

Haul Road Reclamation Study

Volume 8

Geologic Section

Volume 9

Hydrologic Section

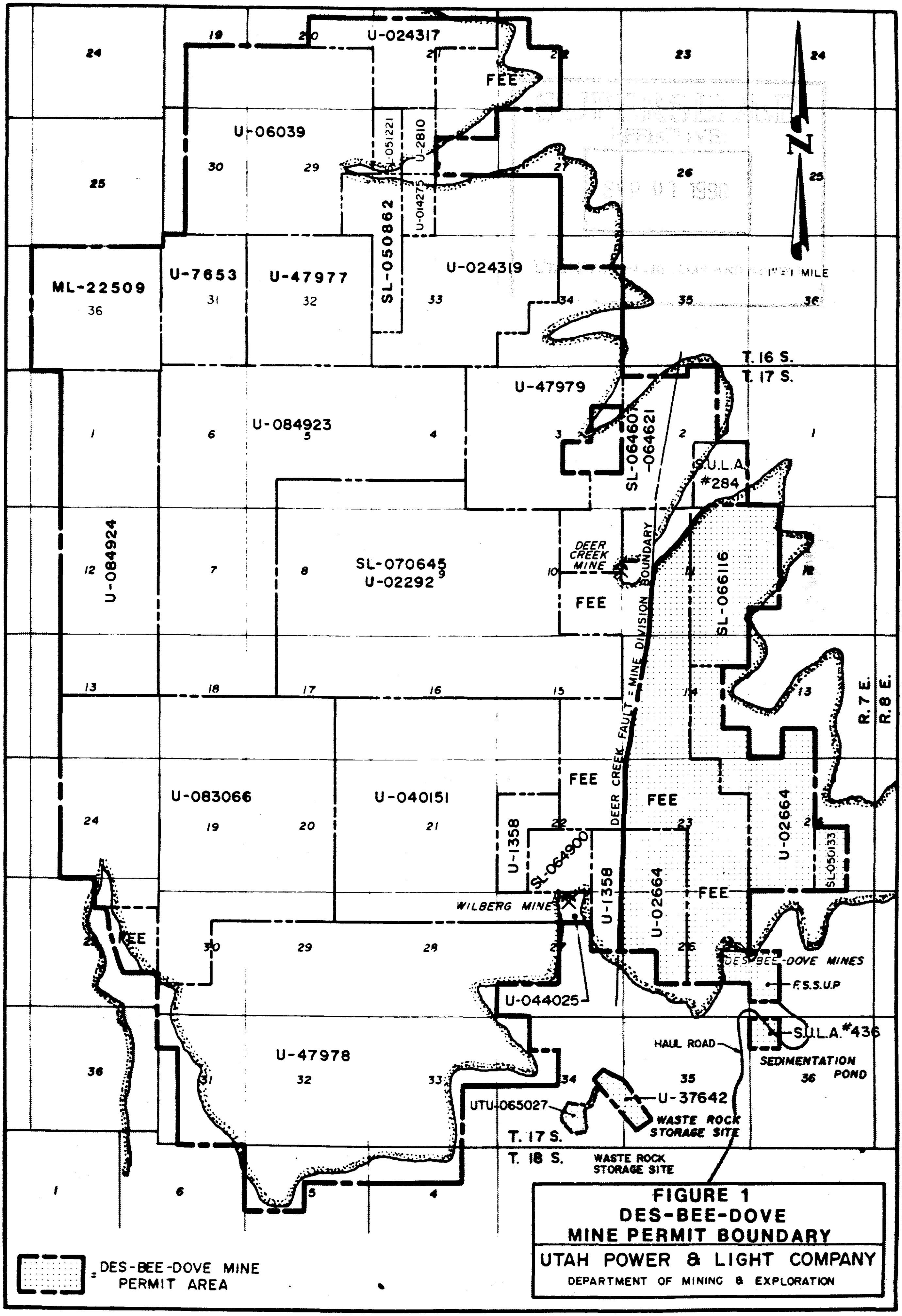


FIGURE 1
DES-BEE-DOVE MINE PERMIT BOUNDARY

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

vegetation, soils and wildlife, apply to the applicant's total contiguous area and can be better evaluated as a whole as they refer not only to the specific mine but to the adjacent area.

All coal mined from Des Bee Dove will be utilized as fuel for Company-owned power plants.

Preparation of this application was completed by PacifiCorp Electric Operations - Fuel Resources Department under the supervision of its Managing Director of Technical Services, Mr. Bart Hyita.

The department staffs sufficient professional and technical personnel to adequately address and narrate the majority of subject matter required for submission of this application.

Where environmental or ecological studies were required, Company engaged qualified consultants to perform work and they are identified on the title pages preceding their respective reports.

Construction drawings, for this project, with appropriate certifications are on file at Company's Fuel Resources Office located at 324 South State, Salt Lake City, Utah.

Pursuant to R614-301-560 applicant states that coal mining and reclamation operations will be conducted in accordance with the approved permit and the requirements of R614-301-510 through R614-301-553.

DES-BEE-DOVE COAL MINE

Owned by	PacifiCorp Electric Operations
Operated by	Energy West Mining Company
Located	7 Miles West of Huntington, Utah
Commence Mining	1938
Average Production	800,000 tons per year
Estimated Mine Life	10 Years
Type of Operation	Underground Coal Mine
Transportation System	Truck haulage to various power plants
Elevation	7,600 feet above sea level
Annual Precipitation	8-10 Inches
Aspect	South Facing

Vegetation Communities	Pinyon-Juniper - Salt Desert Shrub
Drainage	Grimes Wash/Cottonwood Creek
Area of Disturbance	20 Acres - Portal Facilities
	8 Acres - Sediment Pond
	50 Acres - Road

PACIFICORP

DES-BEE-DOVE MINE

APPLICATION FOR MINING PERMIT

This application for mining permit is submitted to the State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining, in accordance with the Utah Coal Mining and Reclamation Act, Title 40, Chapter 10, U.C.A., 1953 (as amended); the applicable rules and regulations adopted thereunder (Part UMC 771.1, et seq.) and subsequent rewritten rules R645 approved April 12, 1990; the Surface Mining Control & Reclamation Act of 1977 (P.L. 95-87), and applicable regulations adopted thereunder (30 CFR 770, et seq.), the Cooperative Agreement between the State of Utah and the United States Secretary of Interior, and other applicable laws and regulations.

IDENTIFICATION OF INTERESTS (R645-301-112)

On January 9, 1989 Utah Power and Light (UP&L) Company, a Utah Corporation and PacifiCorp, A Maine Corporation, were merged with and into PacifiCorp, an Oregon Corporation. At that time all outstanding shares of Capital Stock of PacifiCorp Maine and UP&L were converted into shares of Capital Stock of PacifiCorp Oregon. UP&L became a Division of PacifiCorp Oregon.

On October 1, 1990, Energy West Mining Company, a Utah Corporation and a wholly owned subsidary of PacifiCorp, replaced the UP&L Mining Division as operator of the following coal mines:

the Deer Creek Mine, the Cottonwood/Wilberg Mine and the Des Bee Dove Mine (currently IDLED).

No single shareholder holds in excess of 5% of the stock. There are a total of 123.2 million shares of Pacificorp Common Stock outstanding.

The permit applicant is:

PacifiCorp
One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021
(801) 220-4584

The operator is:

Energy West Mining Company, a Utah Corporation
PO Box 310
Huntington, Utah 84528
(801) 687-9821

PacifiCorp, an Oregon Corporation, with an office located at One Utah Center, Suite 2100, 201 South Main, Salt Lake City, Utah 84140-0021, telephone number (801) 220-4618, will be responsible for the payment of the reclamation fee. Due to the fact that PacifiCorp is a corporation no one person or entity can be held responsible for payment of the reclamation fee.

The resident Agent who will accept Service of Process is Val E. Payne, PacifiCorp - Energy West Mining Company, P O Box 310, Huntington, Utah 84528, (801) 687-4722.

Prior to October, 1990 the Applicant has not operated underground or surface coal mines in the United States during the five years preceding the date of this application under any other name. However, on October 1, 1990, Energy West Mining Company a Utah corporation, replaced Utah Power & Light Mining Division as the mine operator.

Utah Power and Light Company was issued a mining permit (ACT/015/017) for the Des Bee Dove Mine, by the State of Utah, Division of Oil, Gas and Mining on August 29, 1985.

The MSHA identification numbers assigned to the Des Bee Dove Mine are:

Deseret	42-00988
Beehive	42-00082
Little Dove	42-01393

PacifiCorp presently holds the following additional coal mining permits:

Deer Creek Mine

DOGM ACT/015/018 issued February 7, 1986
OSM UT-0016 issued October 28, 1985
MSHA ID NO. 42-00121

Cottonwood/Wilberg Mine

DOGM ACT/015/019 issued July 6, 1984
MSHA ID NO. 42-00080
42-01944

Trail Mountain Mine

DOGM ACT/015/009 Issued November 13, 1992
MSHA ID NO. 45-01211

Centralia Coal Mine

OSMRE PERMIT NO. WA-0001B
MSHA ID NO. 45-00416

PACIFICORP OFFICERS

NAME	ADDRESS
Fred W. Buckman Date Position Assumed 2/1/94	President and Chief Executive Officer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Verl R. Topham Date Position Assumed 5/27/94	Sr. Vice President and General Counsel 201 South Main, Suite 2300 Salt Lake City, Utah 84140
John A. Bohling Date Position Assumed 2/17/93	Sr. Vice President 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Shelly R. Faigle Date Position Assumed 2/17/92	Sr. Vice President 920 SW Sixth Ave. Suite 1000 Portland, OR 97204
Paul G. Lorenzini Date Position Assumed 5/27/94	Sr. Vice President 920 SW Sixth Ave. Suite 1000 Portland, OR 97204
Daniel L. Spalding Date Position Assumed 5/1/80	Sr. Vice President 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Dennis P. Steinberg Date Position Assumed 5/11/94	Sr. Vice President 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Sally A. Nofziger Date Position Assumed 5/17/89	Vice President and Corp. Secretary 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
William C. Brauer Date Position Assumed 2/19/92	Vice President 201 South Main, 2300 OUC Salt Lake City, UT 84140
David F. Hoffman Date Position Assumed 5/11/94	Vice President 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116

Revised 6/1/96

Michael C. Henderson Date Position Assumed 11/8/95	Vice President 825 NE Multnomah, Suite 775 Portland, Oregon 97232
Thomas J. Imeson Date Position Assumed 11/28/90	Vice President 700 NE Multomah, Suite 1600 Portland, OR 97232-4116
Robert F. Lanz Date Position Assumed 1/1/94	Vice President 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Richard T. O'Brien Date Position Assumed 8/9/95	Senior Vice President & Chief Financial Officer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Michael J. Pittman Date Position Assumed 5/19/93	Vice President 920 SW Sixth Avenue, Suite 1100 Portland, OR 97204
Ernest E. Wessman Date Position Assumed 5/19/93	Vice President 201 South Main, Suite 2300 Salt Lake City, UT 84140
William E. Peressini Date Position Assumed 1-1-94	Treasurer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Jacqueline S. Bell Date Position Assumed 5/17/89	Controller 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Lenore M. Martin Date Position Assumed 7/8/87	Assistant Secretary 700 NE Multnomah, Suite 700 Portland, OR 97232-4116
Marsha E. Carroll Date Position Assumed 8/19/92	Assistant Secretary 700 NE Multomah, Suite 700 Portland, OR 97232-4116
John Detjens III Date Position Assumed 7/10/85	Assistant Secretary 700 NE Multnomah, Suite 950 Portland, OR 97232-4116

qwb

John M. Schweitzer Date Position Assumed 6/13/84	Assistant Secretary 700 NE Multnomah, Suite 950 Portland, OR 97232-4116
John R. Stageberg Date Position Assumed 8/15/90	Assistant Treasurer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
Bruce N. Williams Date Position Assumed 8/15/90	Assistant Treasurer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
C. K. Ferguson Date Position Assumed 5/10/95	Assistant Secretary 570 Lloyd Center Tower Portland, or 97232
Thomas W. Forsgren Date Position Assumed 5/10/95	Vice President 201 South Main, 2300 OUC Salt Lake City, Utah 84140
John F. Fryer Date Position Assumed 2/8/95	Assistant Treasurer 700 NE Multnomah, Suite 1600 Portland, OR 97232-4116
J. Brett Harvey Date Position Assumed 11/9/94	Vice President 201 South Main, 2300 OUC Salt Lake City, Utah 84140
Thomas A. Lockhart Date Position Assumed 5/10/95	Vice President 1607 Cy Avenue, P O Box 720 Casper, Wyoming 82602
John E. Mooney Date Position Assumed 11/9/94	Senior Vice President 201 South Main, 2300 OUC Salt Lake City, Utah 84140
Edwin J. O'Mara Date Position Assumed 12/1/94	Vice President 920 SW Sixth, Suite 1500 Portland, Oregon 97204
Paul N. Pechersky Date Position Assumed 1/6/95	Vice President 920 SW Sixth, Suite 1500 Portland, OR 97204

Revised 6/1/96 qub

H. Arnold Wagner Date Position Assumed 5/10/95	Controller and Assistant Secretary of PacifiCorp 201 South Main, Suite 700 Salt Lake City, Utah 84140
Richard D. Westerberg Date Position Assumed 5/10/95	2484 Washington Blvd. Suite 400 Ogden, Utah 84401

RECEIVED
SEP 23 1996
DIV. OF OIL, GAS & MINING

9UB

DIRECTORS OF PACIFICORP

Frederick W. Buckman
700 NE Multnomah, Suite 1600
Portland, OR 97232-4116
Date Position Assumed 2/9/94

Don M. Wheeler
Wheeler Machinery
4901 West 2100 South
Salt Lake City, Utah 84120
Date Position Assumed 1/11/89

Verl R. Topham
201 South Main, Suite 2300
Salt Lake City, Utah 84140
Date Position Assumed 5/27/94

Kathryn A. Braun
Western Digital Corporation
8105 Irvine Center Drive
Irvine, California 92718
Date Position Assumed 11/9/94

Peter I. Wold
Wold Oil & Gas Co.
139 West Second St. P O Box 114
Casper, Wyoming 82602
Date Position Assumed 5/9/95

C. Todd Conover
3 Polo Field Land
Denver, CO. 80202
Date Position Assumed 8/21/91

Keith R. McKennon
Chairman of the Board
825 NE Multonomah, Suite 1055
Portland, OR 97232
Date Position Assumed 2/9/94

Richard C. Edgley
Church of Jesus Christ of
Latter-Day Saints
50 East North Temple
Salt Lake City UT 84150
Date Position Assumed 10/14/87

Nancy Wilgenbusch,
President
Marylhurst College
Marylhurst, OR 97036
Date Position Assumed 10/8/86

Nolan E. Karras
Investment Management &
Research, Inc.
4695 South 11900 West #3
Roy, UT 84067
Date Position Assumed 2/17/93

Robert G. Miller
P O Box 42121
Portland, OR 97242
Date Position Assumed 8/10/94

9ub

RESIGNED/RETIRED OFFICERS

Stanley K. Hathaway
Hathaway, Speight, Kunz & Trautwein
P O Box 1208
Cheyenne, WY 82003-1208
Retired 8/10/94

C. M. Bishop Jr.
Pendleton Woolen Mills
P O box 3030
Portland, OR 97208
Retired 02/09/95

A. M. Gleason
700 NE Multnomah, Suite 1600
Portland, OR 97232-4116
Resigned 05/01/95

William J. Glasgow
Senior Vice President
700 NE Multnomah, Suite 1600
Portland, OR 97232-4116
Resigned 2/28/95

Harry Haycock
Senior Vice President
PacifiCorp
One Utah Center
201 South Main, Suite 2300
Salt Lake City, UT 84140-0021
Resigned 6/94

Stan M. Marks
Vice President
700 NE Multnomah, Suite 1600
Portland, OR 97232-4116
Resigned 8/1/94

John C. Hampton
Hampton Resources, Inc.
9400 SW Barnes RD.
Suite 400
Portland, OR 97725
Retired 2/14/96

OWNERS OF SURFACE LANDS CONTIGUOUS TO THE PERMIT AREA (R645-301-112.600)

Brigham Young University
Provo, Utah 84602

The Estate of Malcolm McKinnon
Zions First National Bank Trustee
Salt Lake City, Utah 84111

LDS Church
Cooperative Security Corporation
115 East South Temple
Salt Lake City, Utah 84111

State of Utah
Division of State Lands
355 W. North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84140-1204

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

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

OWNERS OF SUBSURFACE RIGHTS CONTIGUOUS TO THE PERMIT AREA (R645-301-112.600)

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

State of Utah
Division of State Lands
355 West North Temple
3 Triad Center, Suite 400
Salt Lake City, Utah 84140-1204

Brigham Young University
Provo, Utah 84602

The Estate of Malcolm McKinnon
Zions First National Bank Trustee
Salt Lake City, Utah 84111

LDS Church
Cooperative Security Corporation
115 East South Temple
Salt Lake City, Utah 84111

The applicant is the owner of fee surface and coal rights and the holder of leases related to the Deer Creek Coal Mine and the Cottonwood/Wilberg Coal Mine which are contiguous to the permit area. These properties are detailed separately in the permit application for those mines.

There are no holders of record of any leasehold interest in areas to be affected by surface operations or facilities or coal to be mined other than oil and gas leases and grazing permits.

There are no purchasers of record under a real estate contract of areas to be affected by surface operations and facilities or coal to be mined.

The applicant has no option, bid, or other interest in any contiguous acreage other than as stated above.

Owners of surface rights contiguous to the permit area (R614-301-112.600):

Texaco Exploration & Producing Inc.
P O Box 2100
Denver, Colorado

VIOLATION INFORMATION (R645-301-113)

The applicant has had no coal mining and reclamation permit suspended or revoked or forfeited a performance bond within the five years preceding the date of submission of this permit application.

INCORPORATED
EFFECTIVE:
JAN 30 1997 940
UTAH DIVISION OIL, GAS AND MINING

Revised on
12/10/1996

NOV INFORMATION

V Date	Pit/Mine	Permit No.	NOV #/Agency	Nature	Assessment	Status	MSHA # and Status Date	Comments	Date of Issuance
				Energy West Mining Company					
/02/93	Des-Bee-Dov	ACT/015/017	93-020-190-05 OSM	Failure to control erosion		Abated	01/13/94		42-00988 42-00082 42-01393
/29/91	Deer Creek	ACT/015/018	91-02-246-1 OSM	Permit Transfer	$1200.00 Vacated	Vacated IBLA 92-467 9/26/94	8/4/94		42-00121 6/77
/20/92	Deer Creek	ACT/015/018	92-7-2-1 DOGM	Failure to maintain sediment control structure	$280.00	Terminated	06/04/92	Silt fences repaired	42-00121 6/77
/24/92	Deer Creek	ACT/015/018	92-7-3-1 DOGM	Failure to maintain sediment control	$100.00	Terminated	10/22/92	Remedial action required by 10/21/92	42-00121 6/77
/16/93	Deer Creek	ACT/015/018	93-7-1-3 DOGM	Failure to conduct mining activities in accordance with approved plan - Lower terrace	$500.00	Modified	12/20/93	Abatement submitted	42-00121 6/77
/07/95	Deer Creek	ACT/015/018	95-35-01-01 DOGM	Failure to obtain a permit prior to conducting coal mining activities.		Vacated	8/21/95	Facts appealed to BOGM	42-00121 6/77
/23/95	Deer Creek	ACT/015/018	95-35-02-01 DOGM	Failure to comply with conditions of approved permit.	Pending				42-00121 6/77
3/27/92	Cottonwood Wilberg	ACT/015/019	92-32-6-1 DOGM	Conducting coal mining and reclamation operations outside the approved disturbed area.	$400.00	Terminated	05/06/92	Assessment conference held 6/17/92	42-01944 7/85
0/2/92	Cottonwood Wilberg	ACT/015/019	92-34-1-1 DOGM	Failure to conduct mining in accordance with approved PAP	$640.00	Terminated	10/22/92	Submit plans for mine discharge by 10/20/92	42-01944 7/85
/15/94	Cottonwood Prep Plant	None	94-020-370-002 OSM	Failure to permit Prep Plant	None OSM restrained FDC Order 12/19/94	Administrative Appeal	08/04/95	Appealed to IBLA	42-01944 7/85

				CENTRALIA MINING COMPANY					
9/15/93	Centralia	WA-0001C	93-011-392-2 1 of 2 OSM	Failure to respond to revision order	$ 700.00	Terminated	8/26/94		45-00416 6/77
			93-011-392-2 2 of 2 OSM	Static Safety Factor	$ 1200.00	Vacated	5/9/94	Penalty Vacated	
				BRIDGER COAL COMPANY					
07/22/92	BCC	338-T2	2399-92 AQD	Failure to control dust			01/06/93	Remediation plan approved	48-00677
09/03/92	BCC	338-T2	100306 LQD	Contaminated ground water and soil		Pending	10/12/92	Remedial action is progressing	48-00677
11/19/92	BCC	338-T2	100309 Pt.1 LQD	Failure to strip topsoil before affecting area		Terminated	12/19/92	Remedial action completed	48-00677
11/19/92	BCC	338-T2	100309 Pt.2 LQD	Failure to route all surface runoff from stockpiled coal		Terminated	12/19/92	Remedial action completed	48-00677
06/03/93	BCC	338-T3	100263 LQD	Failure to control sediment	$1000.00	Terminated	01/06/93	Sediment removed	45-00677
10/22/93	BCC	338-T3	100274 LQD	Operating off permit	$3000.00	Abated	01/06/93	IBR submitted	45-00677
5/20/95	BCC	338-T3	100323 LQD	Surface water diversion. Channel failed.	$1,000.00	Terminated	7/11/95	Abated 6/28/95	45-00677
				GLENROCK COAL COMPANY					
11/15/89	GCC	291-T2	100411	Failure to submit renewal application 120 days prior to expiration	$0.00	Terminated	11/16/89	Renewal application submitted 11/16/89	48-00085 3/09/73
1/17/95	GCC	291-T4	100530 LQD	Inadequate pre-strip of top soil. Unprotected top soil.	$1,000.00	Terminated	1/17/95	Penalty Vacated	48-00085

RIGHT OF ENTRY (R645-301-114)

By assignment dated 3/15/72, the LDS Church assigned its right to Federal Coal Lease U-02664 to Utah Power and Light Company, approved 7/1/72 by the BLM.

By special Warranty Deed dated 3/15/72, the LDS Church conveyed to Utah Power and Light Company its rights to the following fee land in Township 17 South, Range 7 East:

Section 14	SW1/4
Section 23	NW1/4, W1/2NE1/4, SE1/4NE1/4, SE1/4
Section 26	NE1/4, NW1/4SE1/4

By Warranty Deed dated 11/13/75, the LDS Church conveyed to Utah Power and Light Company its rights to the following fee lands in Township 17 South, Range 7 East:

Section 11	SE1/4NW1/4, E1/2SW1/4
Section 14	E1/2NW1/4

By Assignment dated 3/24/77, Peabody Coal Company assigned to Utah Power and Light Company its rights to Federal Coal Lease SL-066116, approved by the BLM 9/1/77.

By Assignment dated 7/1/76, S. McArthur and R. Moore assigned to Utah Power and Light Company their rights to Federal Coal Lease SL-050133.

None of these documents are subjects of pending litigation.

AREAS DESIGNATED UNSUITABLE FOR MINING (R645-103)

In consultation with concerned federal land agencies and the Division of Oil, Gas and Mining, no lands within or adjacent to the permit area have been identified as qualifying under R645-103-400 as areas unsuitable for surface effects of underground coal mining activities.

References:

Land Management Plan
Ferron-Price Planning Unit
Manti-LaSal National Forest

Mr. John Niebergall
US Forest Service
Manti-LaSal National Forest
Ferron, Utah

Mr. Sam Rowley
Bureau of Land Management
Price, Utah

Mr. Ron Daniels
Division of Oil, Gas and Mining
Salt Lake City, Utah

No facilities or operations will be conducted within 300 feet of an occupied dwelling.

Applicant has demonstrated that a financial and legal commitment was made prior to January 4, 1977 (Peabody - UP&L contracts for coal delivery). In addition, an updated contact with the state and federal agencies responsible for administrating the unsuitability criteria (US Forest Service, BLM and State of Utah) revealed no action or petition has been initiated.

There are no known restricted areas near the permit area of the Des Bee Dove Mine.

PERMIT TERM (R645-300-153)

This application is for the five (5) year permit term, however, schedules for mining coal included in the mining plan narrative are tabulated for the life of the lease. In addition, mine maps submitted show areas to be mined on a year-by-year basis through the life of the lease.

PERSONAL INJURY AND PROPERTY DAMAGE INSURANCE (R645-301-890)

The liability insurance coverage required by R645-301-890.100 is provided by a policy issued to applicant. Applicant will insure that such insurance coverage is maintained in full force and effect during the life of the permit and through completion of reclamation, or will provide evidence that the self-insurance requirements of R645-301-890.100 have been satisfied by it.

ACORD. # CERTIFICATE OF INSURANCE

11425
SJC

ISSUE DATE (MM/DD/YY) 2/20/96

PRODUCER
Marsh & McLennan, Incorporated
2700 U.S. Bank Tower
111 S.W. 5th Avenue
Portland, OR 97204
Darryl W. Hill

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

COMPANIES AFFORDING COVERAGE

COMPANY LETTER A ASSOC.ELEC.& GAS INS.SVCS LTD.
COMPANY LETTER B
COMPANY LETTER C
COMPANY LETTER D
COMPANY LETTER E

INSURED
PacifiCorp dba Pacific Power
& Light and dba Utah Power
& Light
920 SW Sixth
Portland, OR 97204

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY	XO296A1A96	2/24/96	2/24/97	GENERAL AGGREGATE	$ 2000000
	X COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OP AGG.	$
	X CLAIMS MADE [ ] OCCUR.				PERSONAL & ADV. INJURY	$
	[ ] OWNER'S & CONTRACTOR'S PROT.				EACH OCCURRENCE	$ 2000000
	[ ]				FIRE DAMAGE (Any one fire)	$
					MED. EXPENSE (Any one person)	$
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	$
	[ ] ANY AUTO					
	[ ] ALL OWNED AUTOS				BODILY INJURY (Per person)	$
	[ ] SCHEDULED AUTOS					
	[ ] HIRED AUTOS				BODILY INJURY (Per accident)	$
	[ ] NON-OWNED AUTOS					
	[ ] GARAGE LIABILITY				PROPERTY DAMAGE	$
A	EXCESS LIABILITY	XO296A1A96	2/24/96	2/24/97	EACH OCCURRENCE	$ 35000000
	[ ] UMBRELLA FORM				AGGREGATE	$ 35000000
	X OTHER THAN UMBRELLA FORM					
	WORKER'S COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY LIMITS	
					EACH ACCIDENT	$
					DISEASE-POLICY LIMIT	$
					DISEASE-EACH EMPLOYEE	$
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

(SEE REVERSE AND/OR ATTACHED)

CERTIFICATE HOLDER

State of Utah, Dept. of
Natural Resources, Division of
Oil & Gas
356 W North Temple
Salt Lake City, UT 84180-1203

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ~~XXXXXXXX~~ MAIL 45 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

AUTHORIZED REPRESENTATIVE

Andrea K. Wilson

ORIGINA 1-1

Form B (Additional Insured)

Certificate Number: 46307

ASSOCIATED ELECTRIC & GAS INSURANCE SERVICES LIMITED

Hamilton, Bermuda

CERTIFICATE OF INSURANCE

(Excess Liability)

This Certificate is furnished to the Certificate Holder named below as a matter of information only. Neither this Certificate nor the issuance hereof modifies the policy of insurance identified below (the "Policy") or modifies the Policy in any manner. The Policy terms are solely as stated in the Policy or in any endorsement thereto. Any amendment, change or extension of the Policy can only be effected by a specific endorsement issued by the Company and attached to the Policy.

The undersigned hereby certifies that the Policy has been issued by Associated Electric & Gas Insurance Services Limited (the "Company") to the Named Insured identified below for the coverage described and for the policy period specified.

Notwithstanding any requirements, terms or conditions of any contract or other document with respect to which this Certificate may be issued or to which it may pertain, the insurance afforded by the Policy is subject to all of the terms of the Policy.

NAME OF INSURED: PacifiCorp dba Pacific Power & Light and dba Utah Power & Light

PRINCIPAL ADDRESS: 825 NE Multnomah, #570, Portland, Oregon 97232

POLICY NUMBER: XO296A1A96

POLICY PERIOD: From: 2-24-96 To: 2-24-97

RETROACTIVE DATE: December 24, 1986

DESCRIPTION OF COVERAGE: Claims-First-Made Excess Liability Policy covering claims for Bodily Injury, Property Damage and Personal Injury arising from the operations described below.

LIMIT OF LIABILITY: $35,000,000 per occurrence and in the aggregate, where applicable.

ADDITIONAL INSURED: The Certificate Holder is an additional Insured under the Policy but only (i) to such extent and for such Limits of Liability (subject always to the terms and Limits of Liability of the Policy) as the Named Insured has agreed to provide insurance for the Certificate Holder under the following contract:

Des/Bee/Dove ACT/015/017

and (ii) with respect to the following operations:

Damage to explosions is covered. Insurance Company will notify State of Utah of any changes or cancellation.

Should the Policy be cancelled, assigned or changed in a manner that is materially adverse to the Insured(s) under the Policy, the undersigned will ~~endeavor to~~ give 45 days advance written notice thereof to the Certificate Holder. ~~but failure to give such notice will impose no obligation or liability of any kind upon the Company, the undersigned or any agent or representative of either.~~

DATE: 2-24-96

ISSUED TO: The State of Utah, Dept. of Natural Resources, Division of Oil and Gas ("Certificate Holder")

ADDRESS: 356 West North Temple
Salt Lake City, UT 84180-1203

AEGIS INSURANCE SERVICES, INC

BY: Sandra A. Haas

At Jersey City, New Jersey

ORIGINAL

G:\PPL\LIAB\CERT\96CF-B-1 (7)
9001 (8/87)

1-20

Copies: White-Certificate Holder; Canary-Aegis Insurance Services, Inc.; Pink-Insured; Goldenrod-Broker

CERTIFICATE OF LIABILITY INSURANCE
Issued to:
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining

THIS IS TO CERTIFY THAT:

Associated Electric & Gas Insurance Services Limited
(Name of Insurance Company)

ARGUS Insurance Building, 12 Wesley St. P.O. Box BM 1064, Hamilton, Bermuda
(Home Office Address of Insurance Company)

HAS ISSUED TO

PacifiCorp (Successor in interest to Utah Power & Light)
(Name of Permittee)

DES/BEE/DOVE (Mine Name) ACT/015/017 (Permit Number)

CERTIFICATE OF INSURANCE:

X0296A1A96 (Policy Number) 2-24-96/2-24-97 (Effective Date)

UNDER THE FOLLOWING TERMS AND CONDITIONS:

Per R645-301-890 Terms and Conditions for Liability Insurance:

A. The DIVISION Shall require the PERMITTEE to submit as part of its permit application a certificate issued by an insurance company authorized to do business in the State of Utah certifying that the applicant has a public liability insurance policy in force for the surface coal mining and reclamation operations for which the permit is sought. Such policy shall provide for personal injury and property damage protection in an amount adequate to compensate any persons injury or property damage as a result of the surface coal mining and reclamation operations, including the use of explosives and who are entitled to compensation under the applicable provisions of state law. Minimum insurance coverage for bodily injury and property damage shall be $300,000 for each occurrence and $500,000 aggregate.

B. The policy shall be maintained in full force during the life of the permit or any renewal thereof, including the liability period necessary to complete all reclamation operations under this chapter.

C. The policy shall include a rider requiring that the insurer notify the Division whenever substantive changes are made in the policy including any termination or failure to renew.

IN ACCORDANCE WITH THE ABOVE TERMS AND CONDITIONS, and the Utah Code Annotated 40-10-1 et seq., the Insurance Company hereby attests to the fact that coverage for said Permit Application is in accordance with the requirements of the State of Utah and agrees to notify the Division of Oil, Gas and Mining in writing of any substantive changes, including cancellation, failure to renew, or other material change. No change shall be effective until at least thirty (30) days after such notice is received by the Division. Any change unauthorized by the Division is considered breach of the RECLAMATION AGREEMENT and the Division may pursue remedies thereunder.

UNDERWRITING AGENT:

Sandra A. Johnson
(Agent's Name)

(201) 915-7216
(Phone)

AEGIS Insurance Services, Inc.
(Company Agent's Name)

Haborborside Financial Center, 700 Plaza II
(Mailing Address)

Jersey City, New Jersey 07311-3994
(City, State, Zip Code)

The undersigned affirms that the above information is true and complete to the best of his/her knowledge and belief, and that he or she is an authorized representative of the above-named insurance company. (An Affidavit of Qualification must be completed and attached to this form for each authorized agent or officer.)

Sandra A. Johnson Asst Vice President 2/23/96
(Date, Signature and Title of Authorized Agent of Insurance Company)

Signed and sworn before me by Sandra A. Johnson

this 22nd day of February, 1996

Steinar Midttun
(Signature)

My commission Expires: STEINAR MIDTTUN NOTARY PUBLIC OF NEW JERSEY ~~My Commission Expires Feb. 27, 1999~~
(Date)

LICENSES, PERMITS AND APPROVALS OBTAINED BY APPLICANT TO CONDUCT MINING ACTIVITIES (R645-301-112.400)

NAME AND ADDRESS OF ISSUING AUTHORITY	LICENSE OR PERMIT	ID NO. & DATE OF ISSUE
US Geological Survey Conservation Division 2040 Administration Bldg. 1745 West 1700 South Salt Lake City, Utah 84104	Mining Permit	8/12/75
State of Utah Division of Oil, Gas & Mining 355 West North Temple Salt Lake City, Utah 84180	Mining Permit Hydrologic Monitoring Plan	ACT/015/017 8/29/85
State of Utah Division of Health 150 West North Temple Suite 426 PO Box 2500 Salt Lake City, Utah 84110	Construction Permit for Sedimentation Pond	2/6/79
State of Utah Dept. of Health PO Box 16690 Salt Lake City, Utah 84116	UPDES Discharge Permit Sedimentation Pond	UT-0023591 2/11/88
US Forest Service Manti-LaSal National Forest 599 West Price River Drive Price, Utah 84501	Special Use Permit, 100.41 acres for parking lot, warehouse, bathhouse, office, roads, miscellaneous facilities and spring developments.	2/10/77
	Weather station site	10/14/80
	Special Use Permit - 8.95 Acres Road R/W (Haul Road)	9/24/82

Bureau of Land Management 324 South State Street Suite 301 Salt Lake City, Utah 84111	Microwave site	U-28029 7/15/75
	Escapeway and breakout	U-45337 5/28/80
	Waste Rock Disposal Site	U-37642 8/31/77
	Road R/W (Haul Road) 28.29 Acres	U-50148 9/13/82
Bureau of Land Management (cont)	Road R/W (Pond Access) .37 Acres	U-57134.37 4/1/86
	Waste Rock Disposal Site	UTU-65027 6/8/90
State of Utah Division of State Lands 355 West North Temple 3 Triad Center, Suite 400 Salt Lake City, Utah 84140	Special Use Lease Agreement - 40 acres Sedimentation Pond	SULA-436 11/22/78
	Road R/W (Haul Road) 49.34 Acres	No. 2470 12/21/82
	Road R/W (Pond Access)	No. 3137 4/2/86

LOCATION OF PUBLIC OFFICE FOR FILING OF APPLICATION (R645-300-121.130)

This application will be submitted to the Division of Oil, Gas and Mining and the applicant will file a copy of this application for public inspection at the office of the:

Emery County Recorder
Emery County Courthouse
Castle Dale, Utah 84513

NEWSPAPER ADVERTISEMENT AND PROOF OF PUBLICATION (R645-300-121)

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, One Utah Center, 201 South Main, Suite 2100, Salt Lake City, Utah 84140-0021, hereby announces its intent to file an application for renewal of a Coal Mining Permit for the Des Bee Dove 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.

The area to be mined is contained on the U.S.G.S. 7.5-minute "Red Point", quadrangle map.

The approximately 2,760 acres contained in the permit area involve all or part of the following federal coal leases and fee lands:

The following federal coal leases, upon which the Applicant bases its right to perform coal mining in the permit area, have all been subleased or assigned to Utah Power & Light Company.

Lease No. U-02664
Issued to Corporation of the Presiding Bishop of the LDS Church 1/1/57

Section 13	SE1/4SW1/4
Section 23	NE1/4NE1/4, SW1/4
Section 24	W1/2
Section 26	NW1/4, NE1/4SW1/4
and	
Section 14	SW1/4NE1/4, W1/2SE1/4, SE1/4SE1/4

Added by Modification 10/31/79

Township 17 South, Range 7 East, SLM
Utah, containing 920 acres

Lease No. SL-050133
Issued to Bertha Christensen 8/1/33

Section 24	W1/2SE1/4

Township 17 South, Range 7 East, SLM
Utah, containing 80 acres

Lease No. SL-066116
Issued to Samuel K. Howard 6/1/55

Section 11	E1/2
Section 14	N1/2NE1/4
Section 12	W1/2NW1/4, NW1/4SW1/4

Township 17 South, Range 7 East, SLM
Utah, containing 520 acres

<u>OWNERS OF COAL TO BE MINED OTHER THAN THE UNITED STATES</u>

Description of Land:

Section 11	SE1/4NW1/4, E1/2SW1/4
Section 14	E1/2NW1/4, SW1/4
Section 23	NW1/4, SE1/4, NW1/4NE1/4, S1/2NE1/4
Section 26	NE1/4, NW1/4SE1/4

Township 17 South, Range 7 East, SLM
Utah, containing 1,000 acres

Owner:

PacifiCorp
One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021

Description of Land:

Section 14	W1/2NW1/4
Section 11	W1/2SW1/4

That part lying East of the Deer Creek Fault
Township 17 South, Range 7 East, SLM Utah

Owner:

The Malcolm McKinnon Estate
Zions First National Bank Trustee
Salt Lake City, Utah 84111

SURFACE OWNERS OF RECORD WITHIN THE PERMIT AREA

Description of Land:

Section 11	SE1/4NW1/4, E1/2SW1/4
Section 14	SW1/4
Section 23	NW1/4, SE1/4, NW1/4NE1/4, S1/2NE1/4
Section 26	NE1/4, NW1/4SE1/4

Township 17 South, Range 7 East, SLM Utah

Owner:

PacifiCorp
One Utah Center
201 South Main, Suite 2100
Salt Lake City, Utah 84140-0021

Description of Land:

Section 14	That portion lying East of the Deer Creek Fault in the NW1/4
Section 11	That portion lying East of the Deer Creek Fault in the W1/2SW1/4

Township 17 South, Range 7 East, SLM Utah

Owner:

The Malcolm McKinnon Estate
Zions First National Bank Trustee
Salt Lake City, Utah 84111

The remaining surface is controlled by:

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

ADDITIONAL LANDS TO BE AFFECTED BY MINING

State of Utah Special Use Lease Agreement No. 436 utilized for a sedimentation pond located in NW1/4NW1/4, Section 36, T17S, R7E, SLM.

State of Utah Road Right-of-Way No 2470 (49.34 acres) utilized for the location of the Junction Haul Road located within Section 36, T17S, R7E, SLM and Section 2, T18S, R7E, SLM.

State of Utah Road Right-of-Way No 3137 utilized for the location of the Sediment Pond Access Road located with the W1/2NW1/4 Section 36, T17S, R7E, SLM.

BLM Right-of-Way Grant U-37642 utilized for waste rock disposal. 48.62 acres located in the east half of Section 34 and the southwest quarter of Section 35, T17S, R7E, SLM.

BLM Right-of-Way Grant U-50148 (28.29 acres) utilized for the location of the Junction Haul Road located with E1/2E1/2 Section 35, T17S, R7E, SLM.

BLM Right-of-Way Grant U-57134 (.37 acres) utilized for the location of the Sediment Pond Access Road located within the E1/2NE1/4 Section 35, T17S, R7E, SLM.

BLM Right-of-Way Grant UTU-65027 (25.49 acres) utilized for Waste Rock Disposal located within the SE1/4 Section 34, T17S, R7E, SLM.

United States Forest Service Special Use Permit for surface facilities, 100 acres located in Section 25 and 26, T17S, R7E, SLM.

United States Forest Special Use Permit of 8.95 acres utilized for the location of the Junction Haul Road located within the SW1/4SW1/4 Section 25 and the SE1/4SE1/4 Section 26, T17S, R7E, SLM.

DES BEE DOVE MINE OPERATION

Mining began as early as 1898 in the unnamed canyon where the Des Bee Dove Mine is located. The original mine workings, called the Griffith Mine, were limited in extent due to the rugged terrain and poor access. The Griffith workings were purchased in 1936 by two men, Edwards and Broderick, who fashioned a crude access road and mine until 1938.

Castle Valley Fuel Company purchased the Edwards and Broderick property in 1938. The LDS Church purchased coal lands adjacent to Castle Valley Fuel Company in 1938 and began their operations in that year.

The Church Mine operated under contract to a Mr. Killian of Orangeville until it was closed in 1943 due to World War II. Castle Valley Fuel Company continued to operate until 1947. The LDS Church purchased Castle Valley Fuel's operation in 1947 and combined operations to form Deseret Coal Company, a church welfare project.

Deseret Coal Company continued operations until Utah Power & Light Company acquired it in 1972.

On February 6th, 1987 the Des Bee Dove Mine was temporarily idled. The mine remains idle, on a standby basis, awaiting favorable economic conditions and fuel demand from UP&L power plants. Installation of temporary portal seals and warning signs have been placed. Prior to the resumption of coal mining activity, the applicant will give 6 months advance public notification.

The reactivation of the Des Bee Dove Mine is dependant on several factors:

PacifiCorp Power Supply operations are committed to providing efficient, low-cost electrical service to its customers. In order to achieve this, fuel supplied to coal-fired power plants must be of high quality and competitively priced. Des Bee Dove Mine cannot support the efficient longwall extraction methods utilized at other Applicant mines due to geologic and geographic constraints. However, continuous miner unit efficiency and pillar extraction technology is rapidly improving. These areas are expected to enhance Des Bee Dove's economic viability and promote mine reactivation in the future.

Recently imposed mining restrictions and adverse geologic conditions at the Cottonwood Mine have severely affected the recoverable coal reserve base of East Mountain. Remaining high quality Des Bee Dove reserves are of increasing importance to long-term fuel requirements of UP&L power plants. Approximately 7.1 million tons of recoverable coal remain in the mines which have the potential to supplement current fuel supplies.

Continued problems with foreign oil supplies, proposed acid rain legislation, and regional economic growth are increasing the importance of western coal. In its stand-by condition, the Des Bee Dove operation could react to anticipated coal demands. The Deseret, Beehive and Little Dove mining complex contains the support items necessary to conduct active mining operations. Additionally, sufficient coal reserves remain in the mine in order to sustain needed coal extraction for several years.

When the mine is operating, mining can take place from one or more of three main portals; Deseret, Beehive and Little Dove. Hence the name Des Bee Dove Mine. Mine personnel and coal handling facilities are combined to service all three portals. Mine location is shown on Figure 1.

Two minable seams exist in the Des Bee Dove Mine area. Hiawatha (lower) Seam is mined through Deseret portal. Blind Canyon (upper) Seam is mined through Beehive and Little Dove portals. Approximately 247 acres of minable coal remain accessible in Blind Canyon Seam from Des Bee Dove Mine. The Hiawatha Seam contains approximately 402 acres of minable coal reserve remaining accessible.

The basic Des Bee Dove mining plan consists of a system 4of mains and sub-mains connecting a series of room-and-pillar continuous mining sections. Relatively short mine life and limited remaining minable reserves discount the economics of applying alternative mining methods.

Extracted coal is sized in the Des Bee Dove coal handling facility and trucked predominantly to the Utah Power & Light - Hunter Power Plant, approximately 13 miles.

<u>MINING PLAN</u> (R614-301-500.520)

The Des Bee Dove mining plan is based on the geologic

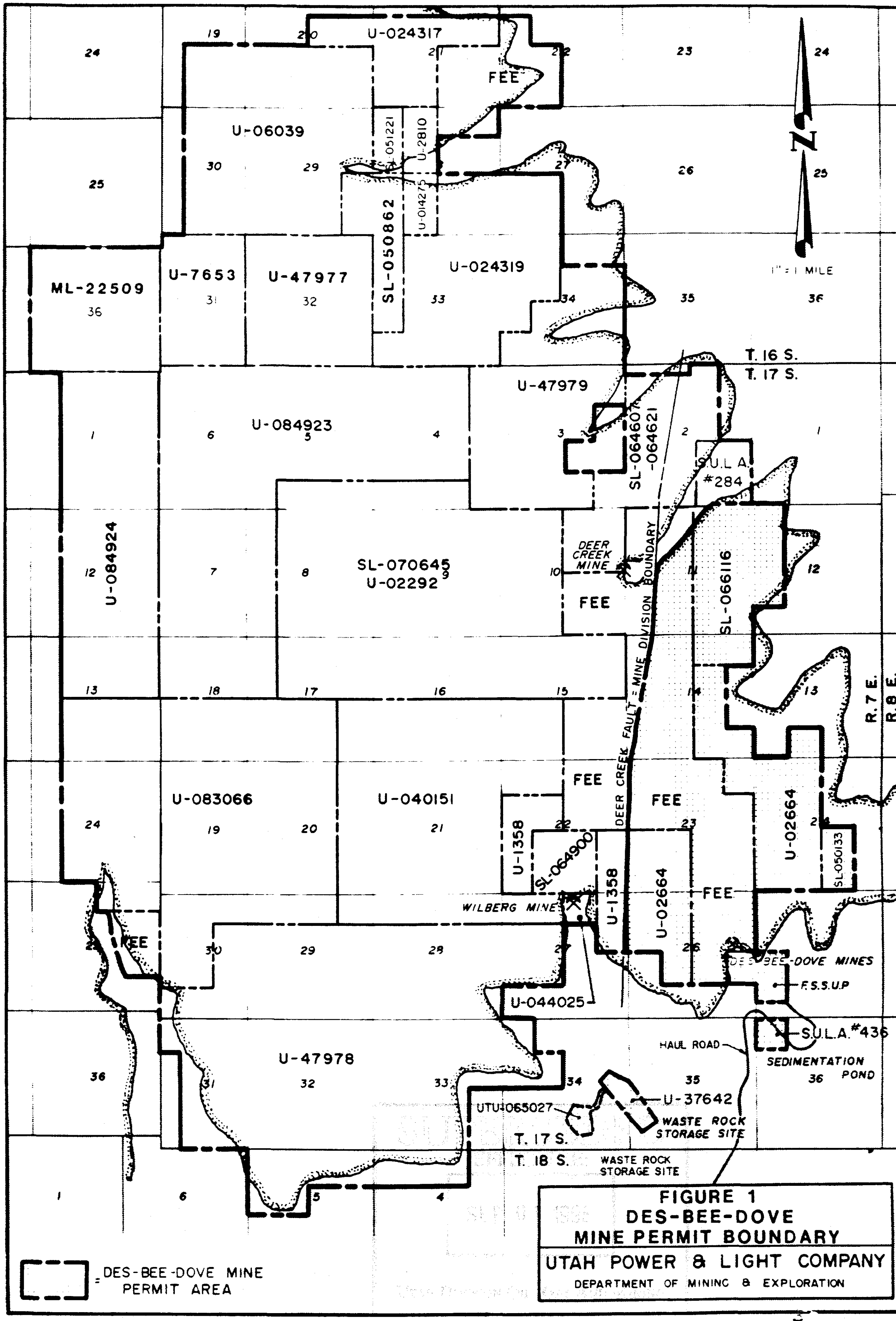


FIGURE 1
DES-BEE-DOVE
MINE PERMIT BOUNDARY

UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

information outlined in Geologic Section. 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.
- Faults - may vary somewhat from currently assumed locations.
- Stratigraphic thinning (pinchouts) - mining limits may vary hundreds of feet as information becomes available and as mining recovery economics and practicality are studied further.
- Underground burned areas - from a practical point of view are undeterminate prior to mining.

Permit boundary and approximate locations of faults affecting the Des Bee Dove Mine plan are illustrated in Maps 3-1 and 3-2. Faults influencing the mining plan are Maple Gulch Fault, Deer Creek Fault, and Bear Creek Canyon Fault.

Mining limits in the Blind Canyon Seam include a less than 5 foot seam thickness. The Blind Canyon 5 foot thickness roughly parallels the Little Dove main entries for approximately one-half mile and effects only a small portion of the overall reserve. The northern extent of mining in Hiawatha Seam was determined by coal splits which occur at the north end of the current Deseret workings. The interburden in the minable area where the two seams overlap varies from 70 to 120 feet.

Since mining through Deseret portal is overlaid by Beehive and Little Dove mining, detailed scheduling has been undertaken to ensure that the upper seam is mined prior to mining the lower seam. This follows prudent engineering and mining practice and predicates the mine layout.

The mine layout, as illustrated in Maps 3-1 and 3-2, is an arrangement of room-and-pillar sections interconnected by a system of six-entry mains and sub-mains. This arrangement is predicated on geographical dedication of reserves and available 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 Hunter Power Plant will influence mining techniques and mine plans.

The most recent mine plan comprises sets of main entries, submain entries, and room-and-pillar sections. The planned extraction sequence accommodates Beehive and Little Dove first. The sequence of mining at Des Bee Dove is shown on Maps 3-1 and 3-2.

At the time the Des Bee Dove mine was idled, an up-to-date mine map showing the final extent of mining and seal locations was filed with MSHA.

Prior to reopening the mines, all necessary plans; roof control, ventilation, training fire fighting and evacuation, and all other plans required under Title 30 CFR will be submitted to MSHA.

COAL RECOVERY

The 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 insure 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 provide effective strata control over each panel. These barriers also act as fire isolation barriers, should combustion due to self-heating of the coal occur in a panel.

Additional barriers 300 to 500 feet wide are left between room-and-pillar panels and the main entries of the mine. These barriers protect the main entries which contain the major ventilation and transportation routes of the mine.

Strata control coal is left in the 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.

Using room-and-pillar mining methods, the maximum amount of economically feasible coal will be recovered from this mine.

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. However, before any modification is made it will first be discussed with the appropriate BLM officials for approval.

Applicant will comply with all special terms and conditions of the federal coal leases.

The following table shows the number of acres affected by mining for each 5 year period.

In areas of seam overlap, only first mining in the area is considered. Subsequent mining in the other seam is not considered since the area has previously been affected.

TABLE 4

ACRES AFFECTED BY MINING

Time Period	# Acres Affected
First 5 Years Production	390
Next 5 Years Production	259
Surface Facilities	20
TOTAL	669

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.

Upon final extraction of the mine, portal seals will be constructed. Prior to any construction, however, BLM officials will be notified and approval obtained.

MINING METHOD

Due to geologic constraints, Des Bee Dove Mine is limited strictly to room-and-pillar methods employing continuous mining units.

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 80 foot centers. The pillars created thereby measure 60 feet by 80 feet, a size which, has proven sufficient to control mining induced overburden stress.

For development of room-and-pillar sections at Des Bee Dove Mine, three to five entries will be opened on advance with two or more developed on retreat in conjunction with pillar extraction. Openings are 20 feet wide on 50 foot x 100 foot centers. The sequence of pillar recovery is shown in Figure 3 (near the end of advance and beginning of retreat and pillaring). Figure 4 shows in detail the method planned for recovering individual pillars.

Figure 6 indicates that at 60% pillar recovery, leaving a foot of top coal, results in just over 50% coal recovery for the mining configuration planned at Des Bee Dove.

MINE PRODUCTION

Mine production is based on an annual requirement of 800,000 tons from Des Bee Dove Mine. Production requirements are

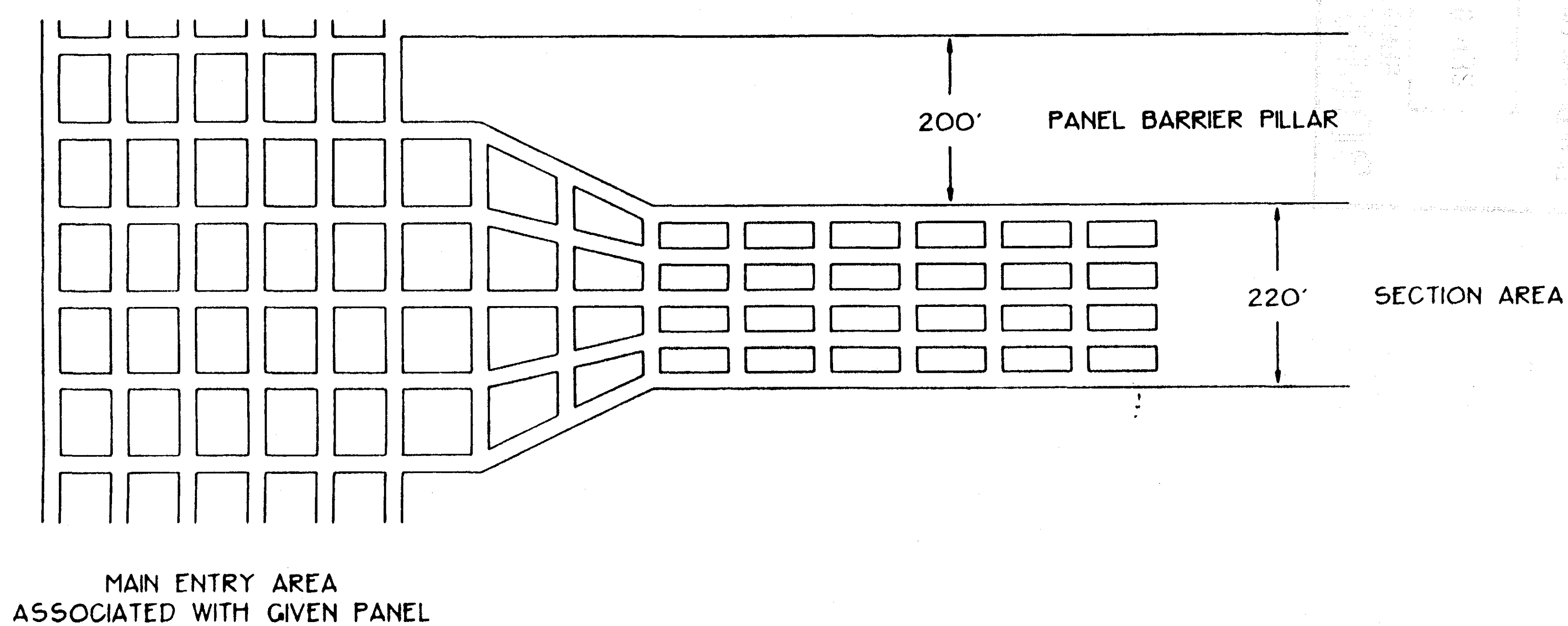
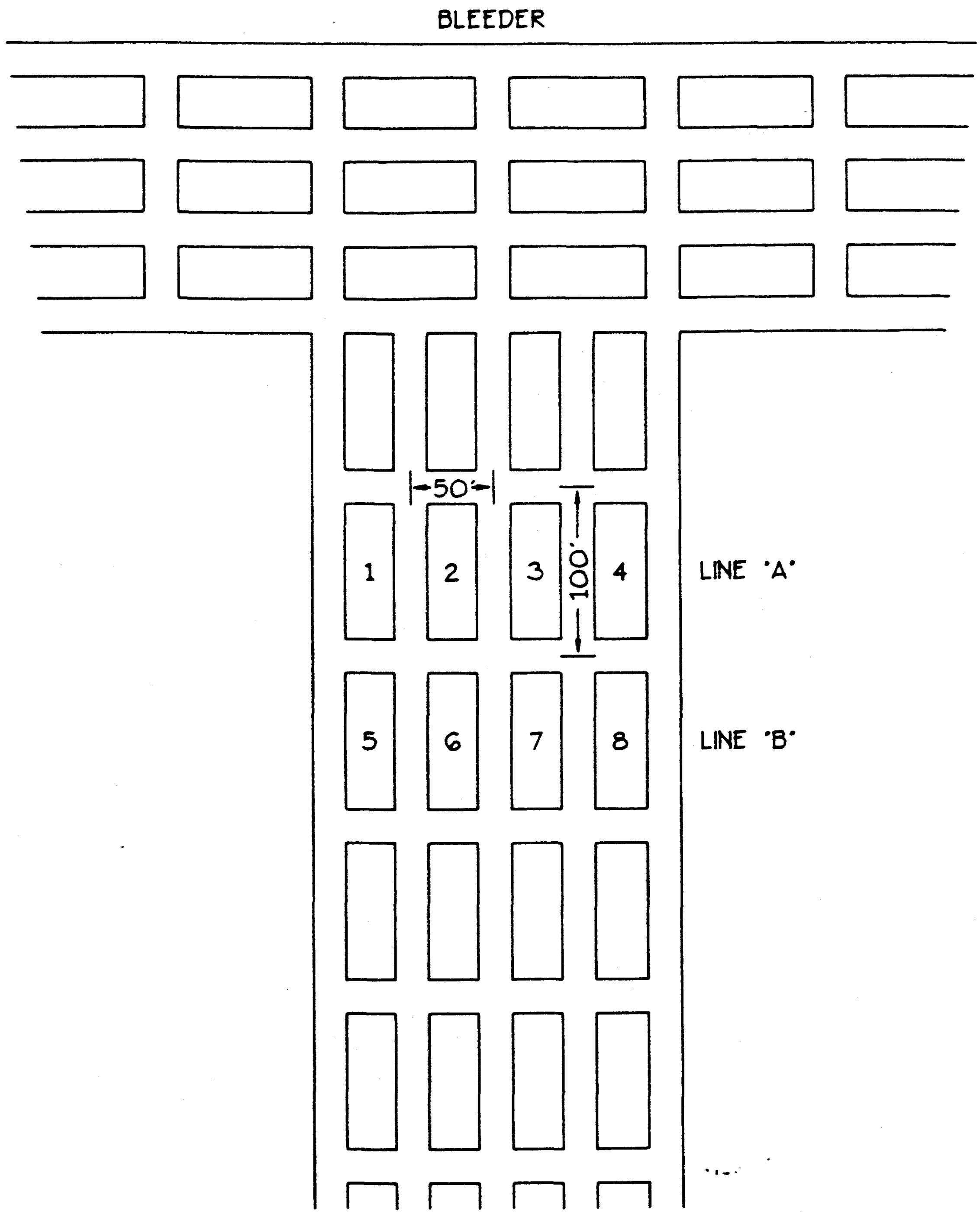


FIGURE 2

CONFIGURATION OF EXTRACTION PLAN FOR
ROOM AND PILLAR SECTIONS AT DES-BEE-DOVE MINE

SCALE: 1"=200'

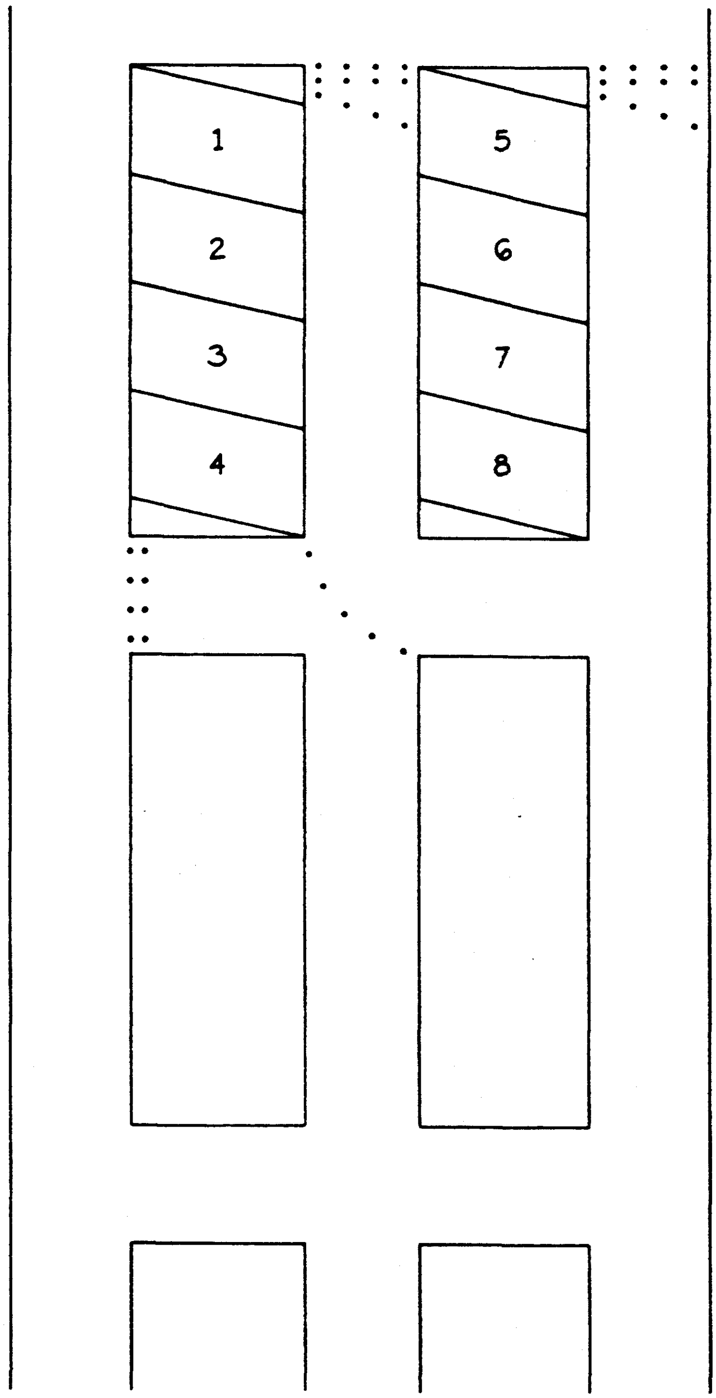


PILLARS IN LINE 'A' WILL BE RECOVERED FIRST. STARTING AT PILLAR #1 GOING TO #4. THEN THE PILLARS IN LINE 'B' WILL BE RECOVERED.

FIGURE 3

SEQUENCE OF PILLAR RECOVERY

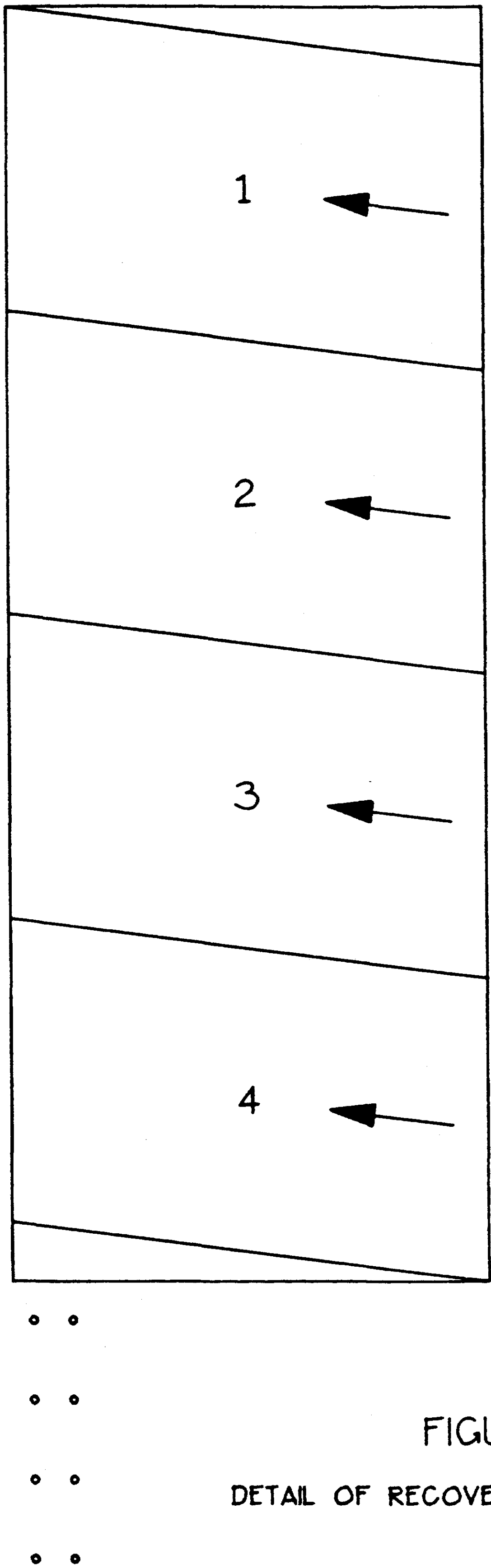
SCALE: 1"=100'

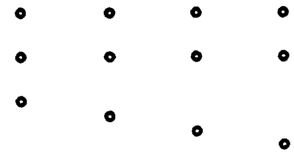


ALL CROSS CUTS AND ENTRIES ARE FULLY BOLTED.
SPLITS 1.2.3.4.5.6.7.+ 8 WILL BE ON A SLIGHT ANGLE.
PILLARS MAY BE PULLED LEFT TO RIGHT. OR RIGHT TO LEFT.

FIGURE 4

CUT SEQUENCE ADJACENT PILLARS





ALL ENTRIES + CROSSCUTS ARE FULLY BOLTED.
HAVE TURN TIMBERS ON 4' CENTERS ON EACH PUSH THROUGH.
WITH THE USE OF REMOTE CONTROL CONTINUOUS MINE. ADVANCE WILL BE LIMITED TO THE EXTENT THAT THE SHUTTLE CAR OPERATOR'S CONTROLS REMAIN UNDER SUPPORTED TOP.

FIGURE 5

DETAIL OF RECOVERING INDIVIDUAL PILLAR

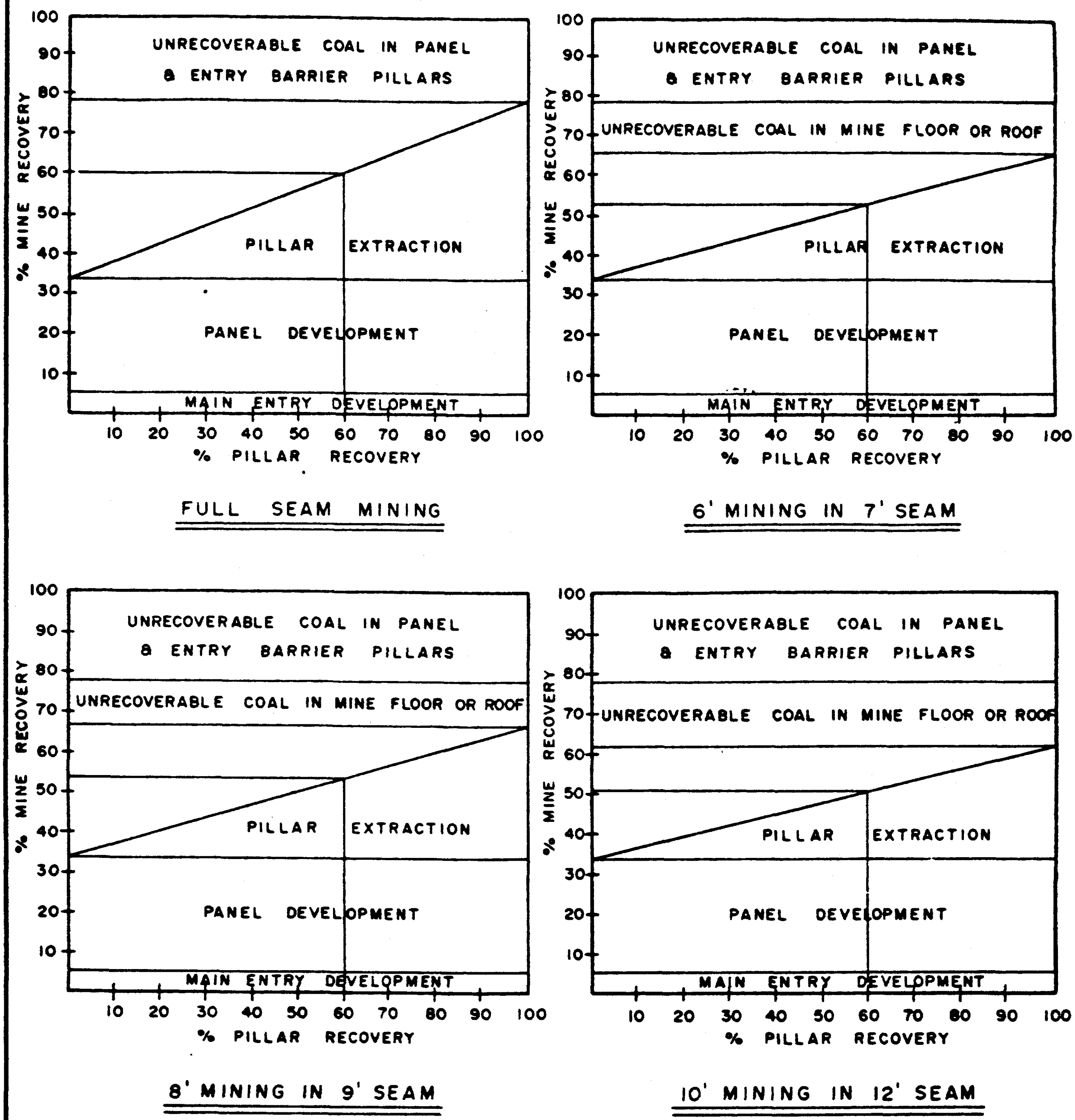


FIGURE 6

RELATIONSHIP OF OVERALL MINE RECOVERY TO PILLAR RECOVERY BASED UPON THE SYSTEMATIC EXTRACTION PLAN FOR THE DES-BEE-DOVE MINE fulfilled by employing two continuous miner units working 234 days per year at an average individual production rate of 875 tons per machine shift. Individual unit production rates vary from the average depending on mining conditions, seam thickness, and operational mode. (Operational modes include: (1) development advance, (2) production advance, and (3) production retreat.)

MINE EQUIPMENT

Many pieces of major underground ancillary equipment are utilized at Des Bee Dove Mine to promote safe and efficient operation of the continuous mining units.

Des Bee Dove Mine is a trackless mine. Men and materials are delivered by rubber-tired diesel tractors and mantrips throughout the mine. All principal in-mine haulage of coal is by belt conveyor. Of the six entries in the main entry systems, one entry is dedicated mainly to conveyor and one to roadways for diesel haulage.

Table 5 lists the major ancillary equipment used in Des Bee Dove Mine.

TABLE 5

DES BEE DOVE MAJOR UNDERGROUND ANCILLARY EQUIPMENT
(When mine is actively operating)

Continuous Mining Units	General Mine
2 - Continuous Miners	2- Compressors
6 - Shuttle Cars	19 - Transformers
4 - Scoops	52,240' - 42" Conveyors

3 - Roof Bolters

25 - Rock Dusters

6 - Power Centers

2 - Feeder Breakers

Continuous Mining Units

20,800' - 36" Conveyors

33 - Conveyor Drives

3 - Foam Generators

5 - Welders

4 - Battery Chargers

General Mine

12 - Diesel Personnel Isuzus

4 - Diesel Mantrips

24 - Material and Equipment Trailers

5 - Diesel Material Tractors

10 - Tool and Material Carts

ENGINEERING PRINCIPLES AND TECHNIQUES

A variety of engineering principles and techniques are applied in the Des Bee Dove 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 include computer simulation of coal extraction, ventilation, and pumping systems, along with research and testing in rock mechanics and subsidence.

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 sections. Computer based long-range planning helps to maximize annual production and better utilize continuous mining units. The two seam nature of the property and consequent need to extract upper seam sections in advance of lower seam 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. Des Bee Dove Mine planning includes these ventilation and hydraulics simulations.

SIGNS AND MARKERS

Signs and markers will be made of durable material, such as thin sheet metal, and will be maintained during the conduct of all activities to which they pertain or until bond release. Each type of sign and marker will be uniform design and shape and will be located so as to be easily seen and read.

Perimeter, buffer zone and topsoil markers will be approximately 10" x 14", be post mounted, and read "Perimeter Do Not Disturb, Buffer Zone Do Not Disturb, or Topsoil" respectively.

On the day in which blasting occurs, a portable sign which says "Warning: Explosives in Use" will be displayed near the entrance sign. The immediate vicinity of blasting will be marked with red flagging or red cones.

A mine permit identification sign will be placed at each point of access from public roads to areas of surface operations and facilities within the permit area. The sign will state the facility's name, owner/operator address and phone number, Utah Reclamation Permit No., MSHA ID No., and NPDES Permit No. The sign size will be approximately 40" wide by 18" high.

Upon cessation of operations or bond release signs and markers will be removed as appropriate.

REPORTING AND EMERGENCY PROCEDURES (R614-301-515)

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

Although the Des Bee Dove Mine facility is currently idled, the facility is visited weekly by the Operator for routine maintenance and inspections. Should a hazard exist or occur, personnel have been instructed to notify the mine operator's office in Huntington, Utah, who will coordinate and implement any emergency procedures and remedial measures to be taken.

Where temporary cessation of operations is necessary for a period beyond 30 days, the applicant will submit the proper notification and information required of R614-301-515.300 to the Division.

MINE FACILITIES

INTRODUCTION

Des Bee Dove Mine facilities are located on 20 acres in an unnamed wash on the perimeter of East Mountain. The natural terrain is rocky, dry and very steep with moderate vegetation. Surface facilities include the following: access haul road, sediment pond, earthen structures, coal stockpile, tipple, facility conveyors, parking lot, office-bathhouse-warehouse, underground shop, materials storage areas, access and service roads, mine ventilation fans, power supply and substation, potable water system, sewer treatment system, and drainage systems. Disturbed areas are, mine area proper, 20 acres; access haul road (2.8 miles), 50 acres; and sedimentation pond area and access road, 8.0 acres.

Specific locations of mine facilities are shown on Maps 3-6 and 3-7.

All facility plans are on file at PacifiCorp Electric Operations - Fuel Resources, 324 South State, Salt Lake City, Utah. They are available for public inspection. Facility photographs are in Appendix IX.

With the exception of mine roads and conveyors, a narrative follows explaining the construction, use, maintenance, and removal of the aforenamed facilities.

DAMS, EMBANKMENTS, AND OTHER IMPOUNDMENTS

Sediment Pond - A pond has been designed and constructed for sediment control at Des Bee Dove Mine. The pond design capacity is 19.8 acre-feet, 2.0 acre-feet for sediment and 17.8 acre-feet for runoff. The pond design will impound runoff from the 10 year/24 hour storm as determined from the N.O.A.A. Atlas 2. A grouted rip-rap spillway is installed in the dam to provide controlled release of runoff from storms in excess of the 10 year/24 hour precipitation event.

During pond construction, inspections were conducted by a professional engineer. Details of pond construction are in Appendix VIII together with reconstructed dimensions after the inundation of the 100 year storm of August 1983. Reconstruction of the pond was completed under the direction of, and inspected by, a professional engineer. The pond is inspected at least yearly by a professional engineer or by a specialist experienced in the construction of impoundments.

Slopes constructed on fill have been revegetated to minimize erosion.

Maintenance of the sediment pond includes quarterly inspections and discharge monitoring. The quarterly inspections for appearance of structural weakness or other hazardous conditions are conducted by a qualified person. A report of the inspections is prepared and retained at the mine field office. A certified annual report by a qualified, registered, professional engineer is submitted to the regulatory authority (the Division) summarizing quarterly inspections in accordance with R645-301-514.312. The pond will be dredged of sediment when sediment volume is 60% of design capacity.

Reclamation of the pond will complete the proposed Des Bee Dove reclamation process. The pond will be allowed to dry followed by backfilling and grading. Graded contours will be compatible with the natural surroundings. Revegetation will be performed as outlined in Reclamation Plan.

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EFFECTIVE:
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UTAH DIVISION OIL, GAS AND MINING

During construction, excess material was placed below and adjacent to the sediment pond. This small disturbance (0.77 acres) has been included in the permit application and will provide the needed reclamation materials for the sedimentation pond after mining. Contemporaneous reclamation includes revegetation seeding completed in August 1984.

Earthen Structures - Five major earthen structures are utilized at Des Bee Dove Mine for support of facilities. They are identified as follows:

1. Tipple Area Structure
2. Bathhouse Area Structure
3. Coal Stockpile Structure
4. Deseret Portal Structure
5. Beehive Portal Structure

Construction details of earthen structures are included in Existing Structures.

Largest of the earthen structures is the tipple area structure providing 4.1 acres of working area. Tipple, material storage, fuel facility, auxiliary coal stockpile, and access road are supported by this structure.

The bathhouse area structure occupies 2.1 acres and supports office-bathhouse-warehouse, parking lots, and material storage shed. This structure is mostly asphalt surfaced.

Less than one-half acre is occupied by the coal stockpile structure. Short term stockpiles are repeatedly constructed here for surge control of the run-of-mine product.

Deseret portal structure, mostly cut and some fill, is founded on the Starpoint Sandstone. This 0.9 acre structure supports Deseret #1 ventilation fan, main substation, coal transfer structure, conveyors, stacking tube (utilized as a coal transfer), material storage, trash bin, and portal access road.

Beehive portal structure occupies 1.1 acres and supports material storage, Little Dove conveyor, a coal transfer structure, Little Dove ventilation fan and a trash bin.

Some small road cut structures are utilized for support of the culinary water storage tank, Beehive ventilation fan, Deseret #2 ventilation fan, secondary substation, and auxiliary water storage.

Maintenance of the structures is minimal. Periodic inspections will be made to observe changes in stable structure condition. Resurfacing of parking areas and regrading of graveled surfaces will be done as needed. Surface drainage structures will be inspected and cleaned as needed to ensure proper drainage and promote stability.

Details of earthen structure reclamation are included in Reclamation Plan.

OVERBURDEN AND TOPSOIL HANDLING AND STORAGE

At present, no facilities exist specifically for overburden and topsoil handling and storage at Des Bee Dove Mine. All overburden removed in the mine area has been utilized as construction material for earthen fill structures. The activities occurred prior to 1977.

COAL HANDLING FACILITIES

Des Bee Dove coal handling system is designed to collect coal on a conveyor and transfer system and prepare three separate facility products. A description of the coal handling system follows. Components of the coal handling system are shown on Maps 3-6 and 3-7.

Facility Conveyors - All facility conveyors are separately identified and discussed in Transportation Facilities.

Transfer Structures - Three separate transfer structures are utilized in the Des Bee Dove coal handling system.

The 16" x 0" run-of-mine product is conveyed out of the mine directly to the stacking tube.

An 80' stacking tube arrangement is utilized to transfer Little Dove coal to the Deseret portal area for transfer to the coal stockpile. The stacking tube transfer collects run-of-mine coal and delivers it to a concrete surge bunker at the base of the tube. Coal is reclaimed via two vibratory feeders at the base of the bunker for transport to the Deseret portal transfer structure.

Deseret portal transfer structure receives run-of-mine product from Deseret portal and Little Dove portal. Coal flow is diverted past an adjustable flop gate onto main and/or auxiliary coal stockpile feed belts.

All transfer structures are steel frame construction on concrete foundations.

Standard mechanical maintenance procedures are applied on transfer structures to ensure smooth operation. Transfer chutes are enclosed and inlets and outlets are rubber curtained to minimize contribution of fugitive dust.

All transfer structures will be dismantled and sold for salvage or scrapped during reclamation. Concrete foundations will be removed, broken up, and used for coarse backfill.

Coal Surge Bin and Stockpile - Coal is collected from the main stockpile feed conveyor in an 800 ton capacity coal surge bin which delivers directly to a reclaim feeder. The surgebin automatically overflows into auxiliary storage adjacent to the bin.

Run-of-mine product is diverted out the auxiliary stockpile feed conveyor for further stockpiling when the overflow stockpile is filled. Maximum coal stockpile capacity is 10,000 tons. Coal is moved to a reclaim feeder by rubber-tired front-end loader. Stockpiles are usually depleted within one month of original placement.

Maintenance of the stockpile area is minimal. Coal stockpiles are moved and cleaned up as soon as possible to minimize chance of spontaneous combustion. Drainage ditches are kept clear to ensure adequate drainage of the stockpile area.

Prior to final reclamation, all coal will be cleared from the stockpile area. The concrete surge bin will be demolished and used for coarse backfill. The earthen structure supporting the stockpile will be reclaimed as detailed in

Figure 7

Reclamation Plan.

Coal Reclaim and Sizing - A single vibratory feeder is utilized to reclaim coal from the short-term stockpile onto a 36" tipple feed conveyor. The run-of-mine product passes two tramp iron magnets before entering the tipple for screening, sizing, and separating. The tipple sizing and separating circuit is illustrated in Figure 7.

Run-of-mine coal is screened of -1 5/8" size before crossing a picking table. Rock and trash are picked from the product stream on the picking table and separated. Rock drops to a bony bin and trash is swept to a trash pile beneath the tipple. The -1 5/8" size coal is delivered to a power plant feed bin (bin #1 on Figure 7).

Lump coal (+6") is screened from the product stream and collected in a lump coal bin or delivered for further crushing. All +1" coal from the second tipple screen (double-deck) and excess lump coal are fed through a Jeffrey Flextooth Crusher and recirculated to the double deck screen for further separation.

Two products are collected from the double-deck screen and removed from the product stream. Minus 3/16" size is delivered to a plant feed product bin (bin #2 on Figure 7). Minus 1" to plus 3/16" size is collected for L.D.S. Church stoker coal or diverted to plant feed bins when the stoker coal bin (#3 on Figure 7) is full.

All product bins are installed with overflow bypass systems except the lump coal bin. Using the identification number of Figure 7, bin #1 overflows to bin #2. Bins #2 and #3 overflow to bins #5 and #6.

Bin #1 which collects power plant feed product (-1 5/8") holds 285 tons maximum. All other bins, including the bony (waste rock) bin, hold a maximum 160 tons.

Plant products are generally gravity fed from the bins and conveyed out the base of the tipple into trucks for transport to various destinations. Power plant feed (-1 5/8") is trucked predominantly to UP&L-Hunter Power Plant. Some power plant feed is trucked from Des Bee Dove Mine to UP&L's Carbon Power Plant. Lump coal (+6") is sold to employees or the L.D.S. Church. Stoker coal is sold to the L.D.S. Church.

Tipple construction is steel frame. Most tipple components are metal construction. Standard building maintenance procedures are applied on the tipple to promote safety and utility. Standard mechanical maintenance procedures are followed to ensure smooth operation and long life of moving parts.

During reclamation, the tipple will be dismantled. metal and mechanical parts will be sold for salvage or scrapped. Concrete foundations will be broken up and used for coarse backfill.

When insufficient trucks are available to adequately deplete the run-of-mine coal stockpile, tipple processed coal is released and placed in a stockpile in the tipple yard. The tipple yard stockpile has a maximum capacity of 8,500 tons. Coal is stockpiled here only temporarily for periods less than a week.

Coal is loaded from the stockpile by rubber-tired front-end loader.

The tipple yard stockpile requires no maintenance.

All coal will be removed from the tipple area prior to reclamation. Details of tipple area reclamation are included in Reclamation Plan.

WASTE ROCK AND NON-COAL WASTE DISPOSAL

A copy of waste rock disposal plans for the Des Bee Dove Mine are included in Appendix V. See Cottonwood/Wilberg application for reclamation.

Non-coal waste is hauled from the mine and placed in concrete trash bins near the mine portals. Two concrete bins are utilized at Des Bee Dove Mine. Locations of these bins are shown on Maps 3-7 and 3-8. Trash is removed from the coal product stream and stacked in a pile beneath the tipple.

Non-coal wastes are collected periodically from the trash bins and tipple trash piles and disposed of in a State approved disposal area.

The trash bins require no maintenance.

During reclamation, concrete trash bins will be broken up and used for coarse backfill.

OTHER MINE FACILITIES

Office-Bathhouse-Warehouse - A 210' x 80' steel frame building is utilized for office, bathhouse, and warehouse facilities at Des Bee Dove Mine. The basic building construction consists of steel reinforced concrete floor, pre-fab steel framing, and heavy gauge aluminum exterior (walls and roof).

Approximately 3,200 sq. ft. are occupied by offices for administrative, clerical, safety, and engineering personnel. Office area interior consists basically of wooden stud framing, sheet rock and wood paneled walls, linoleum floors, and acoustical tile ceilings.

The bulk of the building (8,800 sq. ft.) is dedicated to bathhouse space which includes showers, lockers, bathrooms, and lamp room facilities for miners and supervisors. Interior is basically concrete block walls, bare concrete floors, and open ceilings.

The remaining 4,800 sq. ft. of building space is utilized for storage of small parts, materials, and machinery requiring cover and security.

Standard building maintenance procedures are followed to maintain the office-bathhouse-warehouse.

During reclamation, usable interior components will be salvaged and the building will be demolished and removed from the premises. Concrete floors and foundations will be broken up and used for coarse backfill material.

Parking Lot - A 1.8 acre asphalt surfaced parking area is located near the office-bathhouse-warehouse for use by mine personnel. Approximately 75 designated parking spaces are provided. A 4 to 6 inch thick asphalt surface covers the parking area. Asphalt berms and steel guard rails line the outside edge of the lot.

Runoff from the parking areas is collected within the asphalt berms and directed through the surface drainage system to the sediment pond. The parking lot is cleared of snow and debris and resurfaced as needed.

Asphalt will be broken up and used for coarse backfill during reclamation.

Underground Shop - An underground maintenance shop is located at Des Bee Dove Mine. It occupies approximately 1,100 sq. ft. just inside the portal opening. The shop entrance is concrete block including an 8' x 15' roll-up steel door. Interior is roof bolted and shot creted walls and ceiling with concrete floor.

The underground shop is used for periodic maintenance and minor overhauls on small equipment such as tractors, scoops, and trailers.

Standard building maintenance procedures will be followed on the underground shop to ensure good housekeeping and order.

Reclamation for the shop will include salvaging of usable interior components, demolishing the entrance, and sealing and backfilling the portal.

Material Storage Areas - Approximately one acre of the tipple fill structure is designated for material storage. Items stored in this area include new and used equipment and materials such as steel beams, sheet metal, conveyor belt, wood beams, timbers, and power cable. This material storage area is gravel surfaced and fenced. A concrete salt storage bin is also located in this area.

All outside material storage areas are gravel surfaced.

South of the office-bathhouse-warehouse in the parking lot is a material storage shed. The shed is set on steel pipe stands about 3 feet off the ground. It is 150' long, 10' deep and 12' high with a gradually sloping roof. Shed construction is steel walls, roof and shelving with concrete floors except for one small extension of the shed on the far south end which is wood with concrete floor set on the ground. Chain-link gates on the front of the shed provide the required security.

Items stored in the shed are materials and machine parts requiring limited security and cover.

Deseret storage area is located outside the Deseret portals and occupies space either side of the access road to Beehive portal. Materials stored here include crib blocks, timbers, concrete blocks, bagged rock dust, and roof bolts.

Beehive and Little Dove storage area is just outside Beehive portal. Items stored here are the same as those stored outside Deseret portal.

Maintenance of the outside storage areas are limited to snow and debris removal and resurfacing as needed.

During reclamation, material storage areas will be cleared and reclaimed as outlined in the Reclamation Plan.

Fuel Facilities and Oil Storage - Two separate fuel facilities are utilized at Des Bee Dove Mine. They are identified as follows:

1. Lower Fuel Facility

2. Water Tanker Fuel Facility

Lower fuel facility is located on the west side of the tipple yard on a small rock and soil embankment. Two diesel fuel tanks are in use with 1,000 and 500 gallon capacities. One of the tanks is set directly on the fill and one is on a metal stand.

Due to the dry nature of the mine, water was trucked and pumped to the mine for use in coal dust suppression. A 3,000 gallon diesel fuel tank is provided near the pump house for refueling of the water delivery truck. This facility is no longer used but is retained for emergency use.

Fuel tanks are clearly marked identifying the flammable nature of their contents. These facilities are placed to eliminate the chance of collision with mobile machinery.

In conjunction with reclamation, all fuel facilities will be removed and sold for scrap or salvaged.

<u>Mine Ventilation Fans</u> - Four 150 HP, axial flow fans are utilized to ventilate the Des Bee Dove Mines. They are as follows:

1. Deseret #1 Fan

2. Deseret #2 Fan

3. Beehive Fan

4. Little Dove Fan

Each fan is electric motor driven. Each fan ventilates by exhausting air from the mine through a portal opening with the exception of Beehive fan which draws exhaust air through a shallow shaft. All these fan installations are set on concrete foundations.

During operation, the fans are inspected daily and greased as needed. Mechanical maintenance procedures are followed to keep the fans operational at all times.

During reclamation, the fan installations will be dismantled and salvaged. The fan portals will be sealed. The Beehive ventilation shaft will be plugged and capped from within the mine. Concrete foundations will be broken up and used for coarse backfill.

Power Supply and Main Substation - Power is supplied to Des Bee Dove Mine from a 69 KV fed substation which transforms the utility service down to the utilization level of the mine and surface facilities. The utility service to the main substation along the hillside east of the surface facilities.

The power supply system was installed and is maintained by Utah Power & Light Company - Southern Division.

At the end of mine life, the system will be removed by Utah Power & Light Company - Southern Division. Gravel and foundation material from the substation will be used for backfill.

WATER POLLUTION CONTROL FACILITIES

Drainage System - Des Bee Dove drainage system is designed to adequately collect, pass and control sediment from a

10 year/24 hour precipitation event. No perennial streams are located in the Des Bee Dove drainage. System collection and control are illustrated in Map 3-8.

Runoff is collected from Des Bee Dove drainage "disturbed" and "undisturbed" areas and passed to the sediment pond. The sediment pond and drainages are designed to adequately handle all runoff from the Des Bee Dove drainage.

The drainage system consists of open ditches, bermed roadways, and culverts which collect runoff and divert it into an unnamed tributary of Grimes Wash and ultimately into the Des Bee Dove sediment pond.

Disturbed areas of the Des Bee Dove mining complex totals only 24.5 acres including the sedimentation pond. The area designed for collection and sediment control totals over 297.7 acres (see Sedimentation Pond design calculations Appendix VII). Based on the restrictive topography, this design encompasses all of the canyon in which the mine area is located.

Runoff is handled by an underground piping system together with ditching along access roads which traverse the mining area (refer to drainage Map 3-8). Diversions are sized and placed using a 10 year/24 hour storm event (calculations included) peak flows approach 200 cfs.

The 24 and 36-inch culverts on pads #1 and #2 have the following flow characteristics with the head water depth to culvert diameter ratio equal to 1. Culverts are installed on a 2% slope.

Diameter (inches)	Velocity (fps)	Discharge (cfs)
36	4.2	30
24	3.2	10

Runoff waters flowing off the canyon walls will be collected in the main mining surface drainage system. As the mines are situated in a dry wash, storm runoff is controlled by open ditches and berms constructed within the roadways which wind through the facilities to the bottom of the main loadout structure where a large culvert drains the water into the natural wash bed below the mine proper. Hydrological calculations for the 10 year/24 hour storm event are found in Appendix VII.

The diversion for directing the collected waters is located across the major fill structure (#1). Water is released adjacent to the existing 84-inch half round CMP culvert which drains the entire mine area. See Water collection and diversion drawings in Map Packet 3-11. All waters drained from either disturbed or undisturbed areas are passed through a 19.8 acre foot sedimentation pond located further down the dry wash channel.

Maintenance on the drainage system consists of annual inspection and cleaning of ditches and culverts. Trash and debris are removed and necessary repairs are made to ensure smooth operation of the system.

During reclamation, a revised drainage system will be installed and made operational. Details are included in

Reclamation Plan.

Mine Water - Des Bee Dove Mine is a dry mine. There is no discharge from the mine. Water must be obtained for use in the mine from outside sources. A potentially stable source of mine water has recently been tapped through Deer Creek Fault from Cottonwood/Wilberg Mine into the Little Dove sump. To better utilize the excess mine water from the Cottonwood/Wilberg Mine, a connection has been made through Deer Creek Fault and water is collected and used in the Des Bee Dove Mine. This source supplies the needs of the entire mining complex. (See Route Diagram, Page 3-37.)

Some of the water from Deseret sump is utilized for dust suppression and washdown in the tipple.

The mine water system is maintained to ensure adequate supply to the mine and zero discharge from the mine.

In order to provide one source of water in the mine, a trucking and pumping system has been installed at Des Bee Dove Mine. A tanker truck collects and delivers water from the entrance to Danish Bench road (off State Highway 29) up to a 10,000 gallon buried water tank below the mine area. Water is pumped from the buried tank through a 4" line up to the Deseret sump. The trucking and pumping system will be maintained as a backup for the in-mine source.

During reclamation, exterior pipelines, tanks and pumping systems will be dismantled and removed from the premises. Further reclamation will be performed as outlined in Reclamation

Route Diagram

Plan.

Culinary Water System - A system has been installed to treat water from the Deseret sump for the needs of the mine facility. The water treatment system treats 10 gpm of water for storage and use in the existing culinary water system. The system was designed and installed with approval from the Utah State Department of Social Services.

System maintenance is performed as needed to promote smooth operation of the system and to ensure compliance with State culinary water standards.

During reclamation, the culinary water system will be dismantled and sold for salvage or scrapped.

Sewer Treatment System - Sewage from the office and bathhouse is collected in a single 2,500 gallon septic tank located underground just south of the office-bathhouse-warehouse. Effluent from the septic tank is carried by the 6-inch diameter pipeline to an absorption field located in the tipple area fill structure. The sewer treatment provided fulfills State and local county health codes.

The sewer treatment system requires no maintenance.

For reclamation, the sewer line will be sealed and remain in place. The septic tank will be opened, pumped dry, backfilled and abandoned. The absorption field will be left to dry out.

Alternative Sediment Control Areas - Distrubed areas which cannot be reasonably treated by a siltation structure (i.e., sediment pond) due to remote geographic locations and small areas not justifying a sediment pond but which cannot meet effluent limitations without treatment, are considered Alternative Sediment Control Areas (ASCA). These areas are treated by the best control technology available which includes, but is not limited to: silt fences, berms, catch basins, strawbales, gravel filter dikes, check dams, sediment traps and mulches.

A list of the ASCA's within the permit area is found in Table 7, Page 3-40 (see Plate 3-3).

TABLE 7

DES BEE DOVE MINES

ALTERNATIVE SEDIMENT CONTROL AREA (ASCA)

SITE LOCATION	SEDIMENT CONTROL	ACREAGE	DRAWING	% OF DIST. ACRES
Subsoil Storage (Sediment Pond)	Strawbales/Sediment Trap	.77	Packet 3-7 CM-10388-DS 3 of 3	1
Old Pumphouse Area	Silt Fence/Sediment Trap	.47	Packet 3-7 CM-10388-DS 3 of 3	.6
	TOTAL	1.24 Acres		

Collectable drainage from these areas will be sampled when practical for the following parameters:

1) Iron, total - 7.0 mg/L for any 1 day and a daily average of 3.5 mg/L for 30 consecutive days.
2) TSS (Total Suspended Solids) - 70 mg/L for any 1 day and a daily average of 35 mg/L for 30 consecutive days.
3) pH - Within 6.0 to 9.0 at all times.
4) SS (Settleable Solids) - .5 ml/L; measured during a precipitation event.

Total Runoff Volume Calculations for ASCA:

10 yr. 24 hr. Event = 2.0 inches

$$S = \frac{1000}{CN} - 10$$

S = Infiltration Depth

CN = Curve Number

$$Q = \frac{(P-0.2S)^2}{P + 0.8S}$$

Q = Runoff in inches

P = Precipitation in inches

Subsoil Storage:

CN = 89 (See Table 7.1)

Range, Poor, Soil Group D

S = 1.24

Q = 1.03 inches over .77 acres

Runoff Volume = 2879 cu. ft.

Old Pumphouse Area:

CN = 79 (See Table 7.1)

Range, Fair, Soil Group C

S = 2.66

Q = .52 inches over .49 acres

Runoff Volume = 887 cu. ft.

TABLE 7.1
SCS RUNOFF CURVE NUMBERS

LAND COVER	CONDITION	SOIL GROUP A	B	C	D
VIRGIN LANDS					
Forest	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Farmstead	-	59	74	82	86
Meadow	Good	30	58	71	78
Pasture/Range	Fair	49	69	79	84
REGRADED - REVEGETATED					
Close Seeded Legumes (Contoured & Terraced)	Poor	63	73	80	83
	Good	51	67	76	80
Small Grains (Contoured & Terraced)	Poor	61	72	79	82
	Good	59	70	78	81
Row Crops (Contoured & Terraced)	Poor	66	74	80	82
	Good	62	71	78	81
Fallow	-	77	86	91	94
CLEARED UNVEGETATED					
Dirt Roads	-	72	82	87	89
Hard Surface Roads (or Pit)	-	74	84	90	92
Paved Surfaces	-	98	98	98	98

* Reference

A Compliance Manual Methods For Meeting OSM Requirements, Skelly and Loy, McGraw-Hill, Inc., 1979. pp 6-32

UNDERGROUND DEVELOPMENT WASTE DISPOSAL (R614-301-521.143)

The underground development waste rock disposal and reclamation plans are found in the Cottonwood/Wilberg Mine Waste Rock Storage Facility Volume and Appendix V of this PAP.

TRANSPORTATION FACILITIES (R614-301-527)

Des Bee Dove Mine operation utilizes roads and conveyors in association with facilities described in Operation Plan. All portal facilities are shown on drawings 3-6 and 3-7. A description of the construction, use, maintenance, and removal of each transportation facility at Des Bee Dove Mine follows.

PRIMARY ROADS (R614-301-527.120)

Trucks hauling coal from the Des Bee Dove Mines utilize both the county road system and the 2.8 mile long bypass road to access the State road leading to the Hunter Plant.

Prior to completion of the Des Bee Dove/Wilberg Junction Road (June 1983), access to the mines was along a county road located on Danish Bench. Present traffic is routed along the new road to avoid co-mingling with local traffic.

Construction of the 2.8 mile road benefits two small rural communities, Castle Dale and Orangeville, by diverting traffic away from the towns' main streets. Generally, this segment of road is located in heavily eroded blue shale (Masuk Shales) where steep, barren slopes are predominant features.

Surface flows are collected and channeled in small washes which eventually drain into Grimes Wash.

Widths of the right-of-way vary depending on sizes of the cut-and-fill sections. Of the 86+ acres of road right-of-way approximately 50 acres of disturbance requires reclamation. Reclamation is included under R645-301-534, R645-301-353 and R645-301-242 thru R645-301-252.

The mine access road is approximately 3,300' long beginning at the mine gate and terminating at the mine offices. Plans and selected cross-sections are included in Map 3-9.

During operation, the mine access road is used daily for access by mine labor and service personnel. Twice yearly the mine access road is utilized for cattle drives to and from East Mountain grazing area.

Details of road removal are included in <u>Reclamation Plan</u>.

<u>ANCILLARY ROADS</u> (R645-301-527.110)

All roads which are not designated as primary roads are considered ancillary roads. No delivery and/or service personnel use these roads. The ancillary roads include:

1. Portal Access Road
2. Pumphouse Access Road
3. Sediment Pond Access Road
4. Beehive Mine Substation Access Road

Twice yearly the portal access and Beehive Mine substation access roads are used for cattle drives to and from the East Mountain grazing area.

The portal access road construction consists of compacted soil and gravel surface. Road width averages 20'.

TM permit conditions 9/4/92

Because of steep terrain, large soil berms or steel quardrails have been constructed for safety. The road gradient averages about 10% overall. Again, the steep terrain prohibits more gradual gradients without further extensive construction.

Ancillary road maintenance includes periodic resurfacing, snow removal, and drainage inspection and cleaning as needed.

EAST MOUNTAIN ACCESS

A steep, narrow trail was constructed from the Beehive

Mining & Reclamation Plan
Division of Oil, Gas & Mining

TM date 9/4/92

Mine pad to the top of East Mountain. This trail is used for moving cattle to and from federal grazing leases each year.

No improvements are expected during the active mining period. This access is not considered primary nor ancillary.

CONVEYORS

Seven individual conveyors or sets of conveyors are utilized in the Des Bee Dove coal handling and sizing process outside the mine.

1. Little Dove Conveyor
2. Transfer Reclaim Conveyor
3. Deseret Conveyor
4. Main Stockpile Feed Conveyor
5. Auxiliary Stockpile Feed Conveyor
6. Tipple Feed Conveyor
7. Tipple Process Conveyor

All conveyors from portal to stockpile are 42" wide and are idler-supported with the exception of the Main Stockpile Feed Conveyor, which is wire rope-supported. Steel frames for the conveyor supports are anchored to concrete foundations.

The Little Dove Conveyor is a run-of-mine conveyor which brings the coal out of the mine and delivers it directly to the stacking tube transfer.

Transfer Reclaim Conveyor is 100' long and collects coal from the base of the stacking tube transfer and delivers to the Deseret transfer.

Deseret Conveyor delivers run-of-mine coal production from Deseret and Beehive mine operating sections to Deseret transfer. An in-mine coal transfer delivers coal from Beehive Mine to Deseret Mine.

Main and auxiliary stockpile feed conveyors deliver coal to the run-of-mine stockpile area.

Tipple feed conveyor is 36" wide and delivers coal from the run-of-mine coal stockpile to the tipple for screening, crushing, separating, and loading.

Tipple process conveyors are incorporated in the tipple operation. Size details and tipple process association for these conveyors are illustrated in Figure 7 in Operation Plan.

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

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

OFFSITE SUPPORT FACILITIES (R614-302-260)

The only offsite support facilities are the underground development waste disposal site shared with the Cottonwood/ Wilberg Mine and the sedimentation pond which is detailed in the Existing Structures section.

BLASTING PLAN

A blasting plan is included in Appendix VI.

DIVERSIONS (R614-301-742.200)

Des Bee Dove Mine operation will not require further runoff diversion in the permit area until reclamation. Specific procedures for diversion during reclamation are described in Reclamation Plan. Existing runoff diversions are described in Operation Plan.

IN SITU PROCESSING (R614-302-250)

There are no in situ processing activities or plans for such activities associated with Des Bee Dove Mine.

EXPERIMENTAL PRACTICES (R614-302-210)

No experimental underground mine practices are being conducted at Des Bee Dove Mine.

AIR POLLUTION CONTROL PLAN (R614-301-423)

In accordance with R614-301-423.200, air pollution control measures have been applied and will be applied throughout the life and subsequent reclamation of the Des Bee Dove Mine.

The main service road and parking lots are asphalt surfaced. Service roads to the mine portals are gravel surfaced. Vehicular traffic on these roads is controlled to minimize contribution to fugitive dust. During operation, service roads are used daily at low speeds for access by service and labor personnel.

The steep natural terrain restricts unauthorized travel on other than established roads and limits vehicle speeds on roadways that are established.

Fugitive dust control procedures are implemented in the coal handling process. Little Dove run-of-mine belt conveyor is covered. Belt scrapers are installed on most conveyors to reduce coal dust generation. Coal sizing and handling from stockpile to truck are completely enclosed in the Des Bee Dove tipple. A vacuum system in the tipple helps reduce coal dust generation during crushing and screening plus assists in tipple housekeeping. Transfer points in the tipple are enclosed, rubber curtained at inlets and outlets, and are equipped with dust collection hoods.

The high moisture content of the coal at Des Bee Dove Mine provides dust control throughout the coal handling process. Analysis of samples taken during processing show an average 8.0% inherent and surface moisture content in 775 samples. Table 8 (Page 3-49) is a copy of the sample analysis data. Coal dust generation is reduced throughout the handling process by the dampening effect of this moisture.

The captive nature of the Des Bee Dove Mine product nearly eliminates the possibility of spontaneous combustion conditions developing. Long-term stockpiling within the permit area is unlikely. Maximum stockpile duration is approximately one month. Care is taken to ensure that short-term stockpiles are completely cleared away prior to restockpiling.

<u>OPERATION PLAN EXISTING STRUCTURES</u> (R614-301-526-110)

Under the definition of Existing Structures, as found in Environmental Statement for the Surface Mining Control and Reclamation Act of 1977, is as follows:

Table 8

EXISTING STRUCTURES

The types of structures which may be affected by the regulations in the preferred alternative concerning existing structures are roads and associated structures, fills, berms, benches, waste banks, discharge structures, diversions, rail loops, rail sidings, rail spurs, refuse areas, shafts, spoil pipes, utility lines, terraces, drains, wells, exploration holes, boreholes, barricades, fences, bridges, culverts, storage areas, mine buildings, tipples, storage or repair facilities, surge ponds, processing plants, slurry pipelines, conveyors, and other man-made structures or areas disturbed by mining. "Existing Structures" by definition, as interpreted by Applicant, means everything constructed by man for mining purposes.

To apply the stated provision of R614-301-526-110 to all entities becomes somewhat confusing especially when addressing structural components such as buildings, warehouses, tipples and processing plants.

Monitoring and evidence of how such facilities meet Subchapter "K" seems irrelevant in that the performance standard has no specification to gauge structural worthiness. Unless Subchapter "K" regulates to the building itself but rather the earthen structure upon which such building is situated (explanation by Hardaway).

Nevertheless, to complete the requirements of this subchapter, Applicant chooses to identify all Existing Structures and shall describe the structure (earthen) on which such facility rests.

For the sake of organization and simplicity, we have decided to list the various structures by grouping of associated structures. Group I (Hydrological Association). This group association will list those facilities such as underground diversion, surface drainage systems and sedimentation ponds. Group II shall list and incorporated all surface facilities, building, conveyors, power lines, storage tanks, etc., and all facilities related with operations as they pertain to coal processing. Group III lists only earthen structures, i.e., fills, embankments, road and earthen berms.

GROUP I (HYDROLOGICAL)

SURFACE DRAINAGE

With the exception of the parking lot and bathhouse-warehouse-office facilities, the Des Bee Dove Mines are located within a narrow, steep, dry wash and are connected by a single access road (see Surface Drainage Map 3-8).

The bathhouse and parking lot are graded and ditched to divert runoff waters to the main wash drainage by ditching and culverts.

At the upper section of the loadout area (large fill) where the access begins, the grade reduces to 4 1/2% and drainage is accommodated by a 42" culvert that directs the water to an 84" half-round culvert near the fill face. A drop inlet at the access to the loadout area and an open ditch along the fuel storage area also direct runoff to the 84" culvert.

Hydrological assumptions and calculations are included in the final reclamation section (see 10 year/24 hour event). Peak flows of 106 cfs are anticipated to swell beyond the access road ditch capacity, thus the access road itself will serve as a channel for brief periods of 10 to 15 minutes during heavy precipitation.

Historically, the mine area has controlled surface runoff for forty years.

SEDIMENTATION POND

To meet both State and Federal regulations governing clean water and effluent discharges a 19.8 acre foot sedimentation pond was constructed in 1979. Pond sizing is such as to collect the runoff waters from a 10 year/24 hour storm for the entire drainage area. Sediment storage volume was designed for .1 acre foot per acre disturbed by mining.

Design drawings, hydrological calculations, methodology and monitoring cross sections are included in Appendices VII and VIII.

Because of limited space and precipitous land forms surrounding the Des Bee Dove complex, the sedimentation pond was located away from the surface facilities area and placed at the mouth of the dry wash that drains the mine site. Sited on state lands under Utah State Land Lease #436 (reference, Drainage Map 3-8), this sedimentation pond has been assigned an UPDES permit whose identification number is UT-0023591. Only one discharge point is associated with the permit.

OPERATION PLAN (R614-301-231.100)

Sediment Pond

As stated in the Soils Information section (R614-301-200) no soil sampling or analysis was conducted at the site prior to construction of the sediment pond. However, the soils were later characterized as described within this section.

At the time of construction, it was determined that no topsoil existed in sufficient quantities to warrant separate removal and storage. Therefore, only subsoil has been stockpiled at the location indicated on Plate 3-7 sheet 3 of 3. Approximately 12,650 cubic yards of material were removed using scrapers and transported to the stockpile location Map 2-13, Sheet 1 of 3.

The subsoil stockpile is protected by berms, diversions and sediment control structures.

The sediment pond is monitored each quarter for embankment integrity and sedimentation volume remaining in the pond. An annual report is submitted to the regulatory authority summarizing quarterly inspections.

Volume of pond includes sediment storage from the disturbed area of mining equal to .1 acre foot per acre disturbed. Combined volumes of 17.7 acres of runoff waters from a 10 year/24 hour storm and 2.0 acre feet of sediment storage totals 19.7 acre feet of pond volume. Design volume by cross sections equals 19.8 acre feet (see CM-10555-DS). Sediment monitoring has been ongoing since pond completion April 9, 1980.

On August 12, 1983, a 2.51 inch storm fell within the drainage area treated by the sedimentation pond. This storm inundated the water diversions, collection and storage facilities. Major cleanup operations required heavy equipment to remove debris and sediment trapped in the pond. Changes which occurred during the dredging operation are shown on a resubmitted, as built, drawing. These changes are slight in nature and do not change the operational function of the pond.

The pond is designed to contain totally the runoff from a 10 year/24 hour storm event and the sediment load equalling .1 acre foot per disturbed acre by mining. Per regulations, dewatering will meet effluent discharge limitations and a minimum 24-hour detention. Sediment shall be removed from the pond when sediment accumulations reach 60% of the design storage volume or when 1.2 acre feet of sediment is measured in the pond.

Measured sediment accumulation since the pond was activated shows normal cycle of storm carried sediments from the contributing area is about 1.0 acre foot per year.

SEDIMENT STORAGE VOLUME

Present location of the dewatering stand pipe is set to accommodate five feet of clearance between a full sediment load and the decant elevation.

Operation of the pond requires all storm waters collected to be held for a minimum of twenty-four (24) hours before being released to the receiving drainage. The decant system will allow the water to be drained.

To meet the full 17.7 acre feet of volume needed for the required 10 year/24 hour storm event, the pond will be drained dry with exception of the remaining trapped sediment and water which is below the decant elevation.

The sediment removed during cleaning will be placed in the Waste Rock Disposal Site. Removal and disposal of the sediment will be in accordance with DOGM Title V Coal Program Policy for Disposal of Sediment Pond Waste.

GROUP II (SURFACE FACILITIES AND STRUCTURES)

Des Bee Dove is an abbreviation for Deseret, Beehive and Little Dove Mines. Two mines, Beehive and Little Dove Mine, are located in the upper seam (Blind Canyon), and the Deseret Mine is located in the lower seam (Hiawatha). Separated vertically by 140 feet, the portal facilities are literally one upon the other.

Individual photographs of each major surface facility are included in Appendix IX.

Mine development over the past forty years has seen a constant change of surface facilities. Tipple, loadout, and conveyors have undergone changes from modification to complete rebuilding. Specific dates of construction and completion are not possible in all cases and shall be noted as such.

Utah Power and Light company purchased these mines in 1972. Since that time major reconstruction of certain facilities has taken place, most notably, the bathhouse, parking lot and their structures.

The following list includes the major surface facilities located at the Des Bee Dove Mines, their approximate date of construction, mine association and other relevant information.

Excepting the two large structures that support the bathhouse and loadout facilities, most surface structures are located on three small platforms cut on sandstone ledges located astride the drainage, or wash, and will be further discussed in Group III of this chapter.

Plans and drawings for each structure are on file in the Company's Fuel Resources Office at 324 South State, Salt Lake City, Utah, for review by the regulatory authority.

Company states each facility used for handling, processing and transporting coal has been designed by a registered professional engineer. Also, the bathhouse-shop-warehouse building was engineered to meet acceptable State and Federal building codes. Facilities meet applicable regulations of Subchapter "K" and require no modifications.

DES BEE DOVE MINE FACILITIES

FACILITY	PHOTO	APPROX. CONSTRUCTION DATE
Office-Bathhouse-Warehouse	Included	Mid - 1972
Material Storage Shed		Early 1978
Underground Shop	Included	Early 1981
Tipple	Included	1952-1978
Beehive Trash Bin		Aug. 1980
Deseret Trash Bin	Included	Aug. 1980
Culinary Water Storage Tank		1972
Pumphouse and Mine Water Storage System		1972
Parking Lot	Included	Mid-1977
Main Substation	Included	1975
Deseret Fan #1	Included	1977
Deseret Fan #2	Included	1972
Beehive Fan	Included	1972
Little Dove Fan	Included	1976
Conveyors -		
Little Dove	Included	1977-78
Deseret		1975
Transfer Reclaim		1975
Main Stockpile Feed		1975
Aux. Stockpile Feed		1975
Coal Surge Stockpile	Included	1952
Material Storage Areas	Included	Varied
Fuel Facilities		July 1980
Salt Storage Bin		1987

*Note: Many construction dates are based on the most recent facility modification.

DIVERSION OF WATER INTO AN UNDERGROUND MINE (R614-301-513.600)

As the mines are virtually dry, water for drinking and mining must be piped into the mine.

All water is stored underground where sedimentation and filtration occurs prior to its use in the mining machinery. No water is discharged to the surface at any time.

Water quality meets provisions and does not disrupt the hydrological balance of the underground water regime as no water exists.

HAZARD ANALYSIS - Wilberg Mine to Little Dove Water Diversion

The main water sump located in the Wilberg Mine is formed by a low lying area in the original (old) mine workings. Because the downdip side of these workings has not been intersected by any of the modern entries, this forms an ideal sump without the addition of any dam structures to retain the water. The average storage capacity of 12.9 acre feet is maintained by pumping excess water out of the mine in accordance with an NPDES permit at a maximum rate of 475 gpm. The pumps are automatically activated by water level floats.

Water is also pumped from the Wilberg Mine sump to the Des Bee Dove Mine via a four-inch aluminum underground piping system. The pipeline is located along the Main North 1st Left entry and the First North belt entry to the Deer Creek Fault. The pipeline then crosses the fault through two 3-inch diameter boreholes drilled at an angle of -30° from horizontal. The end of the pipe is located immediately above the main Little Dove sump located at crosscut 38-40 Main North. Water is pumped into the sump at a maximum rate of 200 gpm.

The Little Dove sump is formed by three entries which were driven downdip in a westerly direction to intersect the fault. To increase the storage capacity of the sump, dams are constructed of two cinderblock walls four feet high separated by four inches of compacted bentonite. At maximum level, the sump could contain 1.09 million gallons of water but normally the level of the sump is kept below 0.5 million gallon storage. If the sump were filled to maximum capacity and one or all of the three dams would rupture, water would flow in a north direction in the west most entry of First North. Because these dams are only increasing the storage capacity of the sump by less than 0.3 acre feet the water would quickly dissipate to less than a foot in depth within 1,000 feet of the sump. Nowhere along the last North Little Dove entries is there a low area of the mine working significant enough to cause ponding of the water to block escape by the workers. With the dip of the beds in a west-north-west direction only the westernmost entry would be affected leaving the other five entries dry (see Map 3-5).

GROUP III (EARTHEN STRUCTURES)

The mining complex consists of five (5) major earthen structures (refer to Map 3-10). They are (1) the tipple, coal storage pile and storage yard area: (2) bathhouse-warehouse-office building and parking lot structure; (3) Deseret portal area; (4) upper coal storage area structure; (5) Beehive and

Little Dove portal area.

Structure #1 (Tipple and Material Storage Area)

Of the five sites, the tipple area is largest. This structure was constructed prior to 1977. Waste rock, boney coal and coal fines which, at that time, had no commercial value, were systematically disposed of by end-dumping over a spoil pile then covered with a thick soil mantle.

Volume calculations show approximately 200,000 cubic yards make up this structure which is located in a small wash drainage within the permit area. Structure will be unaffected by subsidence as the fill is situated below the elevations of both coal seams.

Slope stability of the tipple pad area is discussed in Existing Structures - Stability Analysis which follows.

As Company plans to leave the fill in place in the final reclamation plans and based on the fact that the structure was constructed without a subdrain system, the following geological report is submitted as a demonstration that the area is void of springs and seeps.

AREA GEOLOGY

The Des Bee Dove tipple area is located in a dry wash which has been naturally eroded into the bedrock. The walls of this wash are steep near its bottom and slope upward to rock ledges and cliffs which surround the area. The rock walls which form the abutments for the tipple yard consist of alternating zones of sandstone, siltstone and mudstone along the contact of the Starpoint Sandstone and Masuk Shale. The floor of the wash consists of thinly bedded mudstone. All of these rocks form a competent foundation for the tipple yard.

Although no hydrologic mapping was made of the wash prior to its filling with waste rock, the available data overwhelmingly supports the conclusion that ground water does not flow from the bedrock into the mine waste area. The outcrop escarpment at the stratigraphic horizon of the waste dump (Starpoint-Masuk contact) has been hydrologically mapped for miles on each side of the area and no springs have been located or associated with this horizon. The tipple yard and Des Bee Dove mines are located in an area void of ground water, primarily because of existing faults and escarpments that circumvent the area isolating it from the ground water flow present throughout other areas of East Mountain. Geologically, the rock formations in the area of the tipple yard dip in a northwest direction into the mountain. Any water which might flow into the strata would flow down the dip away from the fill structure.

From a geologic and hydrologic standpoint, the area of the Deseret tipple yard is stable. The rock outcrops in the wash from competent abutments for the waste dump. Monitoring (visual observation) of the site throughout more than 40 years of operation support this conclusion.

Test borings have shown the structure is largely composed of coal waste and covered with a 10-foot mantle of subsoil material excavated from the parking lot structure. This covering seals the coal from surface water and possible spontaneous combustion. Covering material was analyzed for acceptance as a plant growth medium and found acceptable. See Pages 4-59 and 4-60.

Surface water is presently directed away from the slope face and directed through an 84" half-round culvert to intersect the natural drainage channel below the fill structure.

Chemical analyses of the overburden and coal indicates only trace amounts of iron and sulfur.

As no ground water exists and surface waters are protected from penetrating the coal core, company states no pollution of water occurs. During operations, sediment shall be collected and controlled by an existing sedimentation pond located down drainage from this structure.

Structure #2 (Bathhouse and Parking Lot

Constructed in 1972, this structure is not a balanced cut and fill section. Excess material was hauled to the spoil fill (site 1) and was used as a covering. Measuring 350 by 190 feet and with the parking lot which measures 400 by 65 feet combined, provides working space of 2.1 acres.

This platform (structure) was constructed using acceptable earth work design practices, i.e., fill portion was built in wetter layers and compacted with a mechanical compactor. Company plans to reconstruct this structure on final reclamation. Stability meets stated factor of safety. A stability analysis is provided in the Appendix (Rollins).

No monitoring is planned for this structure. No ground water affects the fill itself (see Geological Report Structure No. 1) and surface waters are drained by ditching.

No modification is planned as structure meets performance standards of Subchapter "K".

Structure #3 (Deseret Portal)

A strip of level ground, whose base is the basal member of the Hiawatha Coal Seam, which is a massive sandstone outcrop formed by weathering of the dry wash. A 170 by 250 feet landing serves as the Deseret Portal area which supports the mining facilities such as access road, shop area, fan portal installation, power substation and some material storage.

Structure #4 (Coal Storage and Surge Pile)

A small, natural semi-circle sits on bedrock formed by the dry wash channel measures approximately 180 feet. A spur road serves as its only access.

Structure #5 (Beehive and Little Dove Mine Portals)

This flat pad sits approximately 140 feet vertically above the Deseret Mine. Both mines (Beehive and Little Dove) are level entry mines located at the coal outcrop (Blind Canyon Seam).

Constructed from stripped materials along the coal seam and anchored with down-sloped bin walls, this area measures 400 feet long by 140 feet wide. Structure is located on sandstone outcrops again weathered by the drainage with the dry wash.

Structures 3, 4 and 5 are all small disturbances interconnected by one access road.

Stability is unquestionable in that all are located on solid sandstone foundations. The upper area (Structure #5) is susceptible to subsidence only after final mining and pillar removal from the lower seam. It is proposed to leave sufficient entry barriers and pillars with the Deseret portals to support the reclamation work of the Beehive and Little Dove portal areas (see Existing Structures - Stability Analysis).

No monitoring is proposed for these three structures. No modification is planned for the three active sites as company states they meet the performance standards of Subchapter "K".

ROADS - HAUL ROAD, ACCESS ROAD AND MOUNTAIN ACCESS (CATTLE TRAIL)

HAUL ROAD

As previously described in the Existing Structures introduction "roads" are considered existing structures (SMERA-EIS).

Prior to 1982 the haul road was an extension of a county road which is maintained by the county to the permit boundary line. Provision for mining within 100 feet of a public road is given by definition of R614-100-200. As the road was evolved over years of upgrading no engineering maps or cross-sections are available. Company submits instead a 100' = 1" topography map (3-9).

Company, as directed by the Division of Oil, Gas and Mining, submitted information at public hearings held in Salt Lake City about August 1978, concerning roads associated with this mining complex.

Company states the roads, with the exception of the Des Bee Dove/Wilberg junction road, are pre-existing with existing valid rights and are exempt from design standards.

Stability analyses were conducted on road embankments These analyses are presented in Appendix III.

Hydrological balance for the road includes hard surfacing, berms and ditching to accommodate a 10 year/24 hour storm event. No streams are crossed and road pitch does not exceed the stated maximums.

The mine area is in excess of five (5) miles from any live or perennial stream, fishery or fee property owner. Adjacent ownership is controlled by both the Bureau of Land Management and the US Forest Service who reviewed this operation plan.

MINE ACCESS ROAD

A short, steep, winding and unpaved road runs from the tipple area up a bulldozed grade to the warehouse building. It then switches to run upward along a blasted grade, past Coal Storage Pile #1 to the Deseret portal area where it crosses the drainage to traverse southerly along the outcrop of the Hiawatha Seam for 650 feet to another switch back. The base of the coal seam forms the road bed against the near-vertical bluffs. Above the switch back, the road follows a grade partially against a natural cliff and partly against a blasted bank. At 650 feet on this tangent, it intersects the access trail to the top of the mountain. The Little Dove-Beehive portal area begins 150 feet beyond this intersection.

Hydrological protection of the road is described in the surface drainage section. Actually, the road serves as the major drainage channel during peak flows from a 10 year storm event. All sediment carried from this road is recovered in the sedimentation pond located down drainage from the mine site.

Road beds, cut slopes and embankments are proven stable after two decades of use. Road covering consists of crushed rock.

Company states that soil siltation and water quality and quantity have been protected by use of a sedimentation pond, temporary revegetation, limited use and speeds afforded to this road.

EAST MOUNTAIN ACCESS AND CATTLE TRAIL

Originally constructed in 1971 as a four-wheel drive access, this steep trail provides the only other access to the East Mountain plateau besides the Cox dugout road located in Cottonwood Canyon which normally remains snow-bound until mid-June or later. Uses include twice a year cattle drive for cattle grazing on the east portion of the plateau. Need of this access goes beyond the life of the Des Bee Dove Mines.

Company contends that this access is exempt from the regulations based on usage and purpose.

EXISTING STRUCTURES - STABILITY ANALYSIS

Of the five (5) separate and independent earthen structures used for mining purposes only fill Structure #1 or the tipple pad fill, will remain after mining has ended.

Final reclamation of this structure includes a major drainage channel diversion to route the required 100 year storm event around the fill and back into its natural channel. Provisions have been made to control water velocity and erosion (see Final Reclamation map).

This fill structure was built mostly during active mining during the early "forties" and covered with a heavy soil mantle in 1977.

Stability analyses of both major fill Structures #1 and #2 were conducted in 1980 and 1981. Site #2, the bathhouse area, was determined to have a 1.47 safety factor which is sufficient to claim compliance. Site #1, the tipple and loadout structure, was assigned a 1.3 to 1.4 safety factor (see Appendices X and XI).

Additional analysis was done on the slope using the "Simplified Bishop Method of Slices" to determine what modifications needed to be made to modify the slope to meet the 1.5 criterion.

Changing the slope to 1V-2H would result in a minimum safety factor of 1.7 (see Appendix X).

Assumptions were:

Existing material:

$\phi = 27^\circ$

$c = 100$ psf

γ = 70 pcf

no ground water

Added material:

ϕ = 40°

c = 0

γ = 120 pcf

no ground water

Three radii were used in the analysis,

r = 300'	SF = 1.74
r = 250'	SF = 1.68
r = 165'	SF = 1.70

Therefore SF = 1.7 1.5 OK

Thus, based on the above data and calculations the decision was made to modify the slope to a 1V:2H slope with a rock toe buttress.

SIMPLIFIED BISHOP METHOD OF SLICES

(Lambe & Whitman 1969, p. 365)

To analyze a slope for stability, a trial and error process is used to determine the safety factor against failure. A diagram is prepared of the slope and a proposed failure mass with a circular arc failure line is drawn and then broken up into a series of vertical slices. The forces and moments on each slice are summed to determine the total moments acting on the failure mass and the factor of safety is taken as the ratio of the moments resisting movement to the moments initiating movement. The equation for the factor of safety F is

$$F = \frac{\sum_{i=1}^{i=n} [\bar{c}\,\Delta x_i + (W_i - u_i \Delta x_i)\tan\bar{\phi}][1/M_i(\theta)]}{\sum_{i=1}^{i=n} W_i \sin\theta_i}$$

where n = # of slices

$\bar{c}$ = effective cohesion kips per square foot

Δx_i = width of ith slice

W_i = weight of ith slice, kips

= width x average height x density

u_i = pore pressure or neutral stress

ϕ = angle at internal friction of soil, degrees

θ_i = angle of base of ith slice

F = Factor of safety

Where the slopes are not saturated and are in a drained condition with long term loading, the neutral stresses are 0, then

$$F = \frac{\sum (c\, x_i + W_i \tan \phi)\ [1/M_i(\theta)]}{\sum W_i \sin \theta_i}.$$

Because F is present on both sides of the equation ($M_i(\theta)$ is a function of F), then a value of F in $M_i(\theta)$ is assumed and the equation is then solved to obtain a value for F. If the assumed value equals the result, then the assumption is correct. If the assumed value does not equal the result, then a new value is used in $M_i(\theta)$ and the process is repeated until it closes on the correct answer.

A computer program was developed to solve for F when certain basic parameters are given, using the equation above and assuming the failure would be a toe failure, because the fill slopes are located on firm bases.

The basic parameters required are cohesion, density, angle of internal friction, the width of each slice, the average height of each slice, and the angle at the base of each slice.

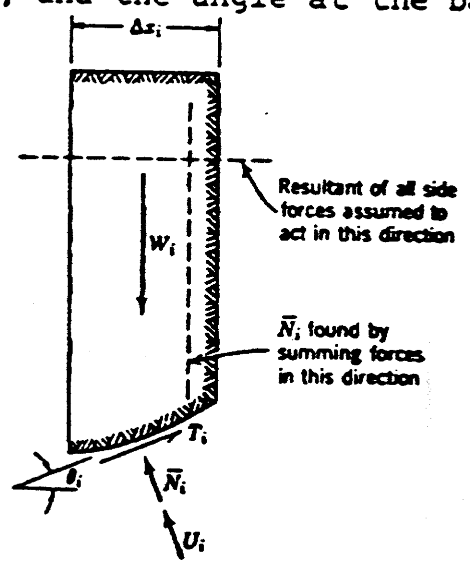


Fig. 24.13 Forces considered in simplified Bishop method of slices

In September of 1984 the out-slope of Structure #1 was modified to meet a 1 to 2 (1V:2H) slope insuring stability beyond the required 1.5 safety factor. Material was dozed from the top of the fill to the toe where it was continually compacted forming an earthen key. As the cut was made at the top, fill was formed at the bottom. On completion there were approximately 5,000 cubic yards moved requiring 10 days.

No slope changes were planned for final reclamation. Required safety factor for final reclamation is 1.3. Slope measurement will be checked after mining and before final reclamation to guarantee safety factors are met.

DES BEE DOVE MINE PORTAL STABILITY

Assumptions

1. Mining in the Deseret Mine will stop at the 200 foot overburden line (maximum overburden supported by remaining pillars is 200 feet).
2. Pillar identified on the map will not be extracted.
3. Minimum pillar size left (50' x 50' x 8').
4. Strength of 50' x 50' x 8' pillar - 2310 psi (USBM formula developed for Beehive Mine).
5. Load on pillar (200 feet maximum overburden) Sp = 431 psi.
6. Safety factor = 5.4.

IMPOUNDMENTS (R614-301-533)

The applicant employed the consultation of Chen Northern Consulting Engineers and Scientists through Johansen & Tuttle Engineering Company to perform the slope stability analysis of the sediment pond and road embankments. The report is dated August 29, 1990, Project No. 5-462-90 and is located in Appendix III.

FINAL RECLAMATION PLAN (R614-301-341)

STRUCTURE REMOVAL

Following completion of mining, work will begin on demolition of the surface facilities. All structural steel, metal siding and other building materials except concrete will be dismantled and disposed of off the permit area. All foundations and structures built of concrete are to be broken up and buried on the bathhouse-warehouse pad as shown on the Final Reclamation Profiles (Map 4-1, Drawing 4 of 5). The asphalt material will also be buried here and then covered with at least 4 feet of non-toxic material.

PORTAL SEALING

After mining has ceased and the surface structures have been removed the portals will be sealed with a double row of concrete block as shown on Figure 1. The backfilling will be done during the backfilling and grading step.

The portal entries are up dip and the mines are virtually dry, therefore, no hydrological seals are necessary.

BACKFILLING AND GRADING

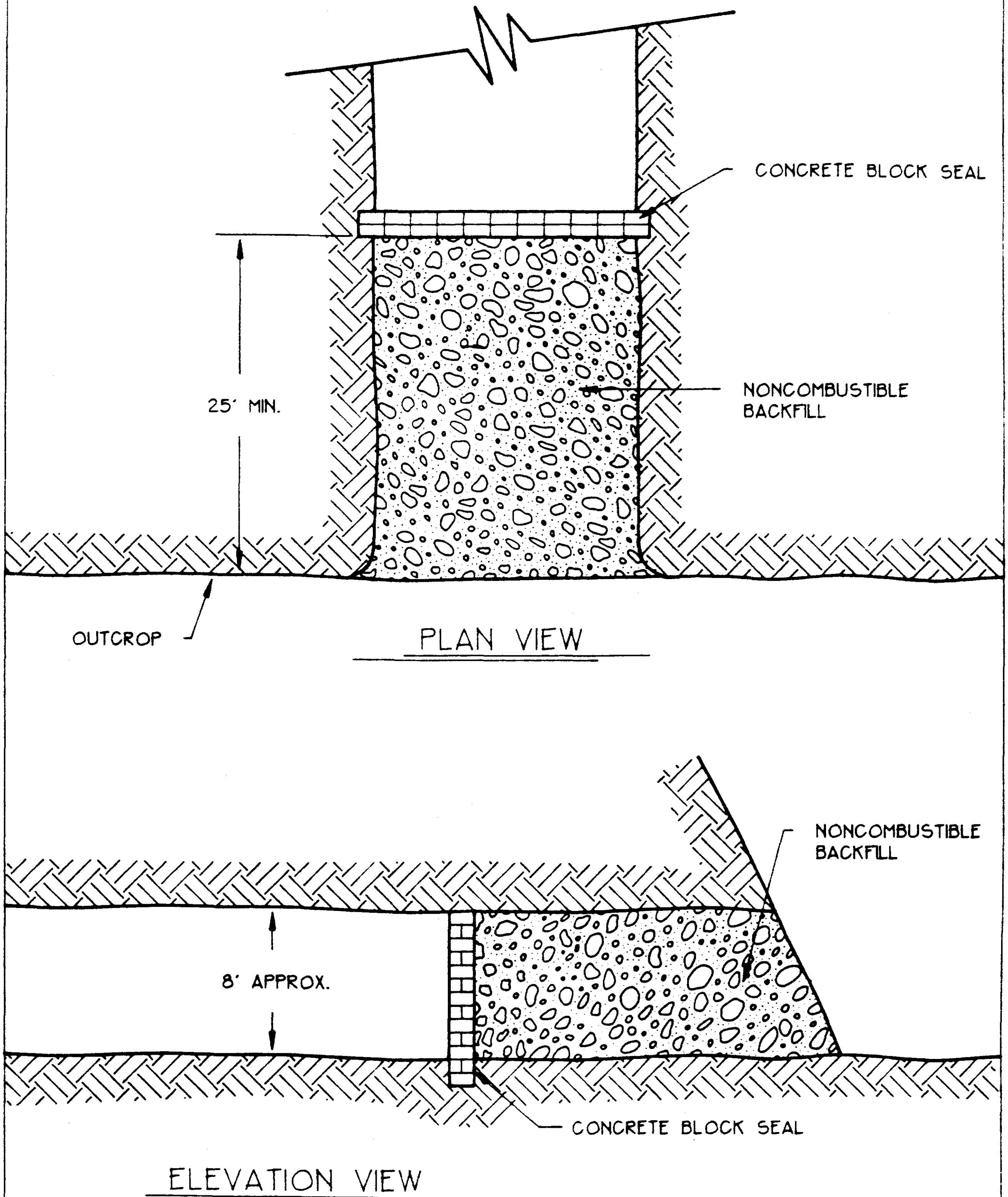
General:

As structure removal is completed the backfilling and grading phase will begin.

All backfilled areas will be constructed in 18" maximum lifts. The lifts will be constructed with a 825C compactor with at least three passes to accomplish the compaction.

Maximum fill slopes will be 2H:1V.

Detailed scheduling and cost estimates follow.



UTAH POWER & LIGHT
MINING DIVISION

DES-BEE-DOVE COAL MINES
TYPICAL PORTAL SEAL

FIGURE 1

DRAWN BY: E. LARSEN	CM-10319-WB
SCALE: NONE	DRAWING #:
DATE: AUG. 24, 1990	SHEET 1 OF 1 REV.

Equipment productivity and haul cycles were calculated using the Caterpillar Performance Handbook. Costs are from the 1990 Rental Rate Blue Book.

The equipment used is listed below:

	Hourly Rate
988B Loader, 375 HP, 7 yd. bucket	$106.88
769C Off-Highway Truck, 35 Ton	74.62
825C Compactor, 300 HP	88.85
621B Scraper, 330 HP, 14 c.y.	84.59
D8G Dozer w/straight blade	63.00
235 Excavator, 195 HP, standard bucket	107.84
D6 Dozer w/angle blade	46.69
John Deere 500 Backhoe	22.30
Flat-Bed Truck, diesel, mediu, 250 HP	16.24
Dump Truck, 50 Ton, 773	84.39
Crane 50T, diesel, hydraulic, Trk MTD	71.90
Air Drill, Track, IR DM25	90.09
Tractor	32.14

*Labor costs are from the Mean's Standard Index, Site Work Costs.

The labor rates used are as follows:

Supervisor	$36.70/hr
Operator - Heavy Equipment	34.20/hr
Laborer	26.05/hr
Truck Driver	27.05/hr
Laborer (Wrecking)	28.85/hr
Helper	25.75/hr

The overall reclamation plan is to remove all fills from the canyon invert to original bedrock. This will form the permanent drainage diversion channel down to the tipple yard. Then, based on hydrological calculation, a channel will be built to bypass the tipple yard fill to a rip-rap fan that will carry the water off the fill down to original ground below the toe of the fill.

Beehive-Little Dove:

Material from the fill section of the pad will be used as backfill across the portal highwall of the Little Dove Mine. The fill will be constructed on a 2H:1V slope, 15 feet high (see Quantity Summary Sheet, Page 4-6).

Parking Lot Extension:

The south addition of the parking area will be backfilled as shown on the Final Reclamation Profiles (Map 4-1, Drawing 4 of 5). Maximum slope 3H:1V. The remaining fill from the Little Dove-Beehive area plus material from the Deseret pad fill area will be used.

Asphalt Removal (included road base material):

The access road beginning where the road meets the tipple yard will be stripped of asphalt. Both parking areas will be stripped. This material will be placed and compacted against the highwall as shown on the Final Reclamation Profiles (Map 4-1, Drawing 4 of 5).

Bathhouse-Warehouse:

The fill section of the pad is to be pulled back and terraced as shown on the Final Reclamation Profiles (Map 4-1, Drawing 4 of 5). Additional material from the Deseret Pad and the #1 Stockpile Pad will be used to finish the fill as shown.

Diversion:

Two small diversions, A and B, (See Map 4-1, Drawing 2 of 5), and the large diversion are to be built as shown on the fill sections of the reclaimed areas to carry storm waters through the canyon.

It is estimated that 10% of the rip-rap needed for the diversion will be taken from the existing fills as they are pulled out. The remaining fill material will be purchased from local contractors. The gravel liners will be excavated from the roadbase and parking lot base. The clay liner will be purchased from local contractors.

Rip-rap Fan:

To carry the water from the fill down to the original ground a rip-rap fan will be built as shown on the Final Reclamation Map (Map 4-1, Drawing 2 of 5). Material to build the fan will be hauled to the site by the contractor.

Removal of 84 Inch Half Round CMP:

Concurrent with the completion of the main channel diversion and rip-rap fan, the 84 inch half round corrugated metal pipe (CMP) will be removed and area revegetated.

<u>SOIL STABILIZATION OF RILLS AND GULLIES</u>

Rills and gullies, which develop to a depth of nine (9) inches or greater in areas that have been regraded and topsoiled, which disrupt the approved postmining land use, or reestablishment of the vegetative cover, or cause or contribute to violation of water quality standards for receiving streams, will be filled, regraded, or otherwise stabilized; topsoil will be replaced; and the areas will be reseeded or replanted. Based on our present maintenance program for fill slopes, we estimate 32 hours per year of work will be needed.

QUANTITIES SUMMARY SHEET

FINAL RECLAMATION BACKFILLING AND GRADING

Little Dove-Beehive Area #5

Total Excavation

Pad 5 X-Section End Area = 983 ft.^{2}

Length of Excavation Pad 5 = 164.8 ft.

983 ft.^{2} X 164.8 ft. / 27 yds^3/ft.^{5} = 6,000 c.y.

Little Dove Highwall Embankment 3,677 c.y.

Little Dove-Beehive Portals 900 c.y.

10% Rip-Rap 600 c.y.

Parking Lot Extension Embankment 823 c.y.

Deseret Area #4

Total Excavation

Pad 4 X-Section End Area = 1,417.5 ft.^{2}

Length of Excavation Pad 4 = 139.68 ft.

1417.5 ft.^{2} X 139.68 ft. / 27 yds^5/ft.^{3} = 7,333 c.y.

Parking Lot Extension Embankment 4,274 c.y.

Deseret Portals Embankment 900 c.y.

10% Rip-Rap 730 c.y.

Bathhouse-Warehouse Embankment 1,429 c.y.

#1 Stockpile Area #3

Total Excavation

Pad 3 X-Section End Area = 1,499 ft.^{2}

Length of Excavation Pad 3 = 117.53 ft.

1,499 ft.^{2} X 117.53 ft. / 27 yds^3/ft.^{3} = 6,525 c.y.^{3}

Bathhouse-Warehouse Embankment 5,869 c.y.

10% Rip-Rap 656 c.y.

COTTONWOOD/WILBERG/DES BEE DOVE HAUL ROAD

General:

This reclamation plan deals with that portion of the road from station 100 + 00 to station 242 + 50, junction with Cottonwood/Wilberg Haul Road. Also from station 100 + 00 to station 59 + 00 at Tipple Yard.

Final reclamation of this haul road is intended to re-establish the original drainage system to the area affected by the road construction.

Timing of the road reclamation will necessarily follow the sediment pond reclamation because this road will be needed for access to the pond site.

Final reclamation will incorporate results of Reclamation Study to be conducted by applicant 1990 thru 1995 as outlined in response to DOGM dated July 31, 1990 (See Appendix XVI, Volume 7).

Erosion and sediment control will be accomplished using soil enhancer, mulch, and tackifier as described in Revegetation Section, Page 4-84. Additional control will be provided by installation of contour ditches on all slopes and earthen berms at the base of all Haul Road reclaimed slopes. See Typical Berm Drawing (Map 4-1, Drawing 3 of 5).

Reclamation Earthwork:

The first step of the reclamation process will be to remove the asphalt and road base material and deposit them at the north end of the project where they will be covered with 4 feet of soil recovered from the excavation for the drainage channels. The amount of asphalt and road base is calculated as follows:

Length of road to be reclaimed = 18,350 feet

Thickness of asphalt = 7.5 inches (14,250')

Thickness of asphalt = 6.0 inches (4,100')

Width of asphalt at mid depth = 36.7 feet (14,250')

Width of asphalt at mid depth = 28 feet (4,100')

$$\text{Asphalt} = 14{,}250 * \frac{7.5}{12} * 36.7 * \frac{1}{27} = 12{,}105 \text{ cyds}$$

$$\text{Asphalt} = 4{,}100 * \frac{6.0}{12} * 28.0 \times \frac{1}{27} = 2{,}126 \text{ cyds}$$

Thickness of road base = 10 inches (14,250')

Thickness of road base = 6 inches (4,100')

Width of road base at mid depth = 43.1 feet (14,250')

Width of road base at mid depth = 34.0 feet (4,100')

$$\text{Road Base} = 14{,}250 * \frac{10}{12} * 43.1 * \frac{1}{27} = 18{,}880 \text{ cyds}$$

$$\text{Road Base} = 4{,}100 * \frac{6.0}{12} * 34 * \frac{1}{27} = 2{,}581 \text{ cyds}$$

These materials will be placed between stations 123 + 50 and 141 + 00 which is 1750 feet. The average haul distance is 5078 feet with an uphill grade of 7.2%. The distribution of these materials will be :

$$(14{,}231 + 21{,}461) / 1750 = 20.39 \text{ cyds/ft}$$

The next step will be to remove the culverts which will not be replaced with drainage channels. This consists of 800 feet of 24 inch culvert and 266 feet of 42 inch culvert.

The third step will be to reestablish the drainage channels, replacing the culverts and installing a rip-rap lining where required.

Backfill quantities are based on the typical cross-sections shown on Drawings CM-10601-DS, sheets 1 through 4, Plate 5-2. The following table gives the size of each channel and the excavation required along with the amount of material to be hauled and the distance and grade.

CHANNEL #	STATION #	CHANNEL WIDTH FT	EXCAVATION LENGTH FT	CHANNEL DEPTH FT	EXCAVATION VOLUME cyds	PLACEMENT LOCATION FROM STA. TO STA.	HAUL DISTANCE FT	GRADE
3	146+00	20	309	85	107,515	123+50 to 141+00	1375	+8%
4	156+50	12	226	57	10,656	148+00 to 151+60	670	+8%
					26,329	161+90 to 170+79	984	-8%
				SUB TOTAL	36,985			
5	161+00	8	126	17	2,560	170+79 to 171+65	1022	-8%
7	173+80	6	198	50	13,200	175+00 to 181+00	420	-1.9%
					10,893	182+00 to 186+95	1068	-7.1%
				SUB TOTAL	24,093			
8	181+50	6	96	10	838	186+95 to 187+33	564	-7.1%
10	201+00	12	199	50	25,579	187+33 to 198+75	796	+7.1%
11	206+90	4	119	9	611	198+75 to 199+03	801	+2.46%
12	213+85	8	114	7.5	552	199+03 to 199+27	1470	+2.46%
13	227+50	6	120	7	529	220+02 to 220+41	729	+2.46%
14	232+20	30	190	47	14,296	220+41 to 231+00	630	+2.46%
					11,475	233+00 to 241+50	505	-2.46%
				SUB TOTAL	25,771			
15	242+35	6	88	10	674	241+500 to 242+00	60	+2.46%

Drainage Reestablishment:

Hydrologic Analysis

The object of the reclamation plan is to return the drainage pattern to as near the original scheme as possible. Reclamation of the haul road will require removal of the existing culverts and replacing them with ditches or channels designed to handle the anticipated peak flows with minimum erosion. All reestablished drainages are designed for the 100 year, 6 hour storm event, which is a total of 2.2 inches of precipitation (NOAA Atlas 2, Volume VI, Figure 24). The calculation of the peak flows is by the computer program "Storm Hydrograph Program", Richard H. Hawkins and Kim A. Marshall, Utah State University Foundation, Logan, Utah, 1979. (Exhibit I) The program has been modified to provide a more correct distribution of both the 6 and 24 hour storms according to the Soil Conservation Service (SCS) type II distribution. The program utilizes the SCS curve number and dimensionless unit hydrograph techniques as described in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4). The input data required for the program includes the area, curve number (CN), time of concentration (tc), duration and precipitation.

The area for each drainage basin was determined by planimeter. Curve numbers were determined from Figure 9.6 and Table 9.1 of NEH-4 and field inspection of the drainage areas. Refer to Drawings CS1130D, Plate 5-3, and KS1190C, Plate 5-3B, for drainage areas.

TABLE 1

DRAINAGE #	CN	BASIS FOR SELECTION
3	85	Appendix VIII PAP
4	83.5	1/2 10% Pinyon Juniper Cover CN = 87 1/2 30% Pinyon Juniper Cover CN = 80
5	80	30% Pinyon Juniper Cover
6	76	40% Pinyon Juniper Cover
7	80.8	1/4 10% Pinyon Juniper Cover CN = 87 1/2 30% Pinyon Juniper Cover CN = 80 1/4 40% Pinyon Juniper Cover CN = 76
8	76	40% Pinyon Juniper Cover
9	87	Reclaimed Road
10	79.6	1/3 10% Pinyon Juniper Cover CN = 87 2/3 40% Pinyon Juniper Cover CN =
11	73	50% Pinyon Juniper Cover
12	73	50% Pinyon Juniper Cover
13	73	50% Pinyon Juniper Cover
14A	66	Area UA-1 Cottonwood/Wilberg PAP
14B	73	Area UA-6 Cottonwood/Wilberg PAP
14C	83.5	1/2 10% Pinyon Juniper Cover CN = 87 1/2 30% Pinyon Juniper Cover CN = 83
14D	87	10% Pinyon Juniper Cover
14E	73	50% Pinyon Juniper Cover
15	73	50% Pinyon Juniper Cover

The time of concentration for each drainage area was determined using equation 15.3 and 15.4 of NEH-4 which applies to drainage areas less than 2000 acres.

$$Tc = \frac{T\ Lag}{0.6} \quad \text{Eq. 15.3}$$

$$T\ Lag = \frac{(L)^{.8} \quad (S+1)^{.7}}{1900 \quad (y)^{.5}} \quad \text{Eq. 15.4}$$

Tc = time of concentration, hours
T Lag = lag time, hours
L = hydraulic length, feet
$S = \frac{1000}{CN} - 10$
y = slope, percent

The peak flow rate for Drainage Area #14 is determined by routing the peak flows from the 5 subareas to the point where the channel will be reclaimed. To simplify the procedure, it is assumed that areas 14A and 14B discharge at a Point X (Drawing KS1190C, Plate 5-3B) and areas 14C and 14D discharge at Point Y and area 14E discharges at Point Z, which is the site of the reclaimed channel.

By examination of the flow rates for each drainage area, it is determined that because the peak flows from areas 14C and 14D are so much larger than the flows from the other areas, the combined peak flow will come from the peaks associated with areas 14C and 14D.

TABLE 2

flow rate, cfs

TIME	14A	14B	14C	14D	14E	C+D	ALL
2.00	0	0	0	16	0	16	16
2.33	0	5	89	210	1	299	305
2.66	6	51	320	441*	9	761	827
2.75	9	66	374	411	11	785	871
2.85	12	85	415	344	14	759	870
2.96	17	108	431*	275	16	706	847
3.00	19	114	426	254	17	680	830
3.33	38	162	365	166	18	531	749

*Peak Flows

Refer to computer print outs, Exhibit II.

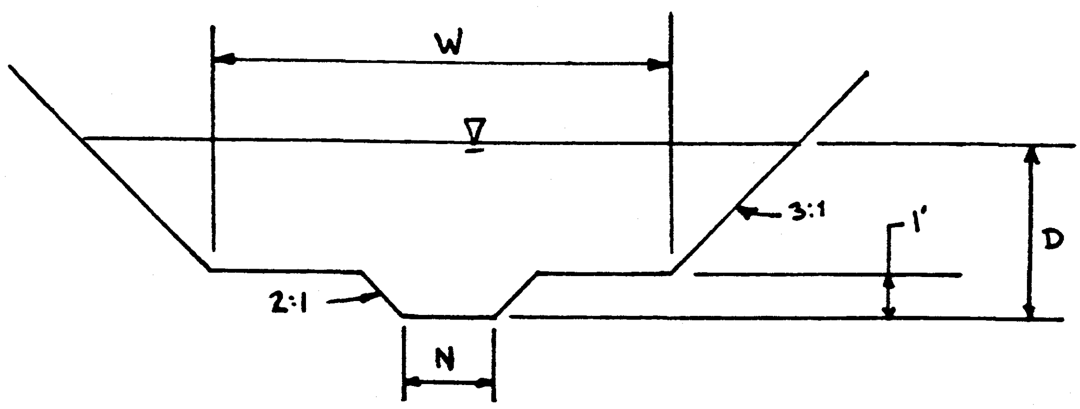
The travel time in the stream bed is estimated using Manning's equation:

$$V = \frac{1.49}{n} R^{2/3} \quad S^{1/2}$$

where:

V = velocity, fps
n = Manning coefficient of roughness
R = Hydraulic radius = A/WP
A = Cross sectional area, ft^2
WP = Wetted perimeter, ft
S = Slope = Rise/Run

A typical cross-section of the stream bed from Point X to Point Y has a narrow channel for normal flows within a wider channel for peak flows.



$$\text{for } D \leq 1', \quad A = ND + 2*(1/2)*(2D)*(D)$$

$$= ND + 2D^2$$

$$WP = N + 2 * (2.236) * D$$

$$= N + 4.472 D$$

$$\text{for } D>1', \quad A = N*(1) + 2*(1/2)*(1) + WD + 2*(1/2)*(3D)*(D)$$

$$= N + 1 + WD + 3D^2$$

$$WP = 2*(3.162)*D-1) + W - (N+4) + N + 2*(2.236)*(1)$$

$$= 6.324D + W - 5.852$$

Combining Manning's Equation with the equation for flow, Q=VA where Q equals the flow rate in cfs, yields:

$$Q = \frac{1.49}{n} \frac{A^{2/3}}{WP^{2/3}} S^{1/2} \quad A$$

$$Q = \frac{1.49 \quad S^{1/2}}{n} \frac{A^{5/3}}{WP^{2/3}}$$

The above equation is solved for D by trial and error. Once the depth of flow is known, the travel time is determined by the following:

travel time = flow length/velocity

$$= \frac{\text{length}}{Q/A} = \frac{\text{length x area}}{\text{flow rate}}$$

The solution of the travel time along with the determination of the flow depth was obtained by a routine on a programable calculator. (Exhibit III)

By trial and error it was determined that the combined flow of areas 14A and 14B at 2.54 hours, which equals 35.2 cfs, would require 0.21 hours to travel the 5750 feet from Point X to Point Y and would arrive at 2.75 hours. This would combine with the flow from areas 14C and 14D to total 820 cfs. This combined flow would then travel the 7550 feet from Point Y to Point Z in 0.15 hours and arrive at 2.90 hours. At that point the 15 cfs flow from area 14E combines with the other to yield a peak flow at Point Z of 835 cfs.

Travel time Calculations:

Point X to Point Y

length = 5750 feet
slope = 7%
wide channel width = 20 feet
narrow channel width = 5 feet
flow rate from areas 14A and 14B at 2.54 hours = 35.2 cfs
depth of flow = 0.715 feet
travel time = 0.209 hours

Point Y to Point Z

length = 7550 feet
slope = 4.8%
wide channel width = 25 feet
narrow channel width = 5 feet
flow rate from areas 14A, 14B, 14C, and 14D at 2.75 hours = 820 cfs
depth of flow = 1.70 feet
travel time = 0.146 hours

TABLE 2.1

DRAINAGE #	AREA ACRES	AREA MILES^2	L FEET	Y %	CN	tc	Q PEAK FLOW cfs
3	301	.47	7020	35	85	.361	235
4	44.2	.069	2610	68.1	83.5	.123	35.1
5	12.8	.02	1940	27.8	80	.171	7.5
6	4.5	.007	965	17.9	76	.137	2.0
7	60.8	.095	3526	32.8	80.8	.247	34.8
8	9.0	.014	1289	11.7	76	.214	3.5
9	5.1	.008	1724	6.7	87	.250	4.6
10	159	.248	5593	16.3	79.6	.526	59.1
11	15.4	.024	3086	6.2	73	.644	2.5
12	67.2	.105	4330	6.9	73	.800	10.1
13	42.2	.066	4046	5.4	73	.857	6.2
14A	1620	2.531	15530	16.0	66	1.763	98.1
14B	1396	2.181	13450	17.5	73	1.244	184
14C	1050	1.640	13550	21.4	83.5	.822	431
14D	599	.935	9300	30.3	87	.452	442
14E	124	.194	7000	12.5	73	.524	18.3
14	4789	7.481	-	-	-	-	835
15	52.5	.082	4767	5.5	73	.968	7.5

REFER TO COMPUTER PRINTOUTS, EXHIBIT II

Channel Design

Each of the culverts to be replace has a drainage basin associated with it which will contribute runoff to the proposed channels. Drawing CS1130D, Map 5-3, shows the location of each of the channels to replace the culverts. Channel numbers 1, 2, 6 and 9 are not used because they are not required to replace existing culverts. Drainage areas #1 and #2 will be diverted to channel 3 and runoff from drainage areas 6 and 9 will flow overland as it did before the road was constructed.

The length and elevation change of each proposed channel was obtained from Map 5-3 and was used to design the lining material. The design procedure comes from D. J. Barfield, R. C. Warner, and C. T. Haan, Applied Hydrology and Sedimentology For Disturbed Areas, Oklahoma State University, Stillwater, Oklahoma, 1981. A computer program was written utilizing the channel design - rip-rap lining section (page 185) of the book (Exhibit IV). A printout of each channel design is included in Exhibit V. Drawing CS1129C, Plate 5-3A compiles design parameters and rip-rap lining sizes for each of the channels.

Rip-Rap Lining Gradation

The chart on Plate 5-3A displays the maximum diameter of the rip-rap material for each drainage channel. This value is equal to D100 which is the particle size that is larger than 100% of the rip-rap material. In actual practice, very few pieces would be equal to the D100 size. The D50 size, or size which is larger than 50% of the material, is a more representative size.

The rip-rap material will be selected to meet the following conditions:

$$D50 = 1/2 * D100$$

$$D20 = 1/4 * D100$$

The tolerance to be used in the above is $\pm$ 5%, meaning D45 to D55 would be equal to 1/2 * D100.

A filter material is required where the size of the rip-rap is much larger than the base material. The filter material will be selected to meet the following conditions:

1) $\frac{\text{D50 (filter)}}{\text{D50 (base)}} < 40$ and $\frac{\text{D50 (rip-rap)}}{\text{D50 (filter)}} < 40$

2) $5 < \frac{\text{D15 (filter)}}{\text{D15 (base)}} < 40$ and $5 < \frac{\text{D15 (rip-rap)}}{\text{D15 (filter)}} < 40$

3) $\frac{\text{D15 (filter)}}{\text{D85 (base)}} < 5$ and $\frac{\text{D15 (rip-rap)}}{\text{D85 (filter)}} < 5$

SOURCE: BARFIELD, ET. AL., page 195

Tolerance $\pm$ 5%

Soil samples will be taken from the locations of the reestablished channels to determine the gradation of the base material. Samples will be collected and analyzed for final selection 6 months prior to construction and results submitted to the Division for approval. These test results will be used with the above constraints to make the final selection of the filter material.

The depth of the rip-rap layer will be equal to the D100 size of the lining material. The filter layer thickness will be equal to one half the rip-rap layer thickness with a minimum of six inches.

```
1 CLS:REM     MODIFIED STORM HYDROGRAPH PROGRAM (CHANGED DATA LINES 150 & 160 TO
2 REM         CONFORM TO SCS TYPE II STORM)
4 REM         REVISED 3/14/89 TO GIVE MORE DETAILED RAINFALL DISTRIBUTION
5 REM         REVISED 6/28/89 ADDED 6 HOUR DISTRIBUTION
10 KEY OFF
20 SCREEN 2
30 DIM V(3)
40 DIM Q(6)
50 DIM H(14)
60 DIM S(14)
70 DIM P(30)
80 DIM T(30)
90 DIM B$(3)
102 DIM G2(2289)
103 DIM G3(2289)
104 DIM G4(2289)
105 DIM G5(2289)
106 DIM G6(2289)
149 REM   SCS TYPE II DISTRIBUTION
150 DATA 0,0,8.333,2,16.667,5,25,8,33.333,12,41.667,18,43.75,20,45.83,23.5,47.92
,28.3,50,66.3
160 DATA 52.08,73.5,54.17,77.2,56.25,79.9,58.333,82,66.667,88,75,92,83.333,96,91
.667,98,100,100
161 REM
169 REM   FARMER-FLETCHER DISTRIBUTION
170 DATA 0,0,10,36.5,20,61.5,30,76.9,40,83.9,50,88,60,90.8
180 DATA 70,93.2,80,95.2,90,97.7,100,100
181 REM
184 REM   SCS 6 HOUR DISTRIBUTION
185 DATA 0,0,8.333,3.5,16.667,8,25,13.5,33.333,23,41.667,60,50,70
186 DATA 58.333,78,66.667,83.5,75,88.5,83.333,92.5,91.667,96.5,100,100
190 PRINT
200 PRINT TAB(13)"S T O R M  H Y D R O G R A P H  C A L C U L A T I O N S"
210 PRINT
220 PRINT TAB(17)"ENTER LISTED PARAMETERS"
230 PRINT TAB(19)"1. Watershed Identification"
240 PRINT TAB(19)"2. Runoff Curve Number"
250 PRINT TAB(19)"3. Time of Concentration (Hrs.)"
260 PRINT TAB(19)"4. Runoff Area (Sq. Miles)"
270 PRINT TAB(19)"5. Storm Duration (Hrs.)"
280 PRINT TAB(19)"6. Rainfall Depth (Inches)"
290 PRINT TAB(19)"7. Distribution (1=SCS Type II 2=Farmer-Fletcher 3=SCS 6 Hr.)"
300 PRINT: PRINT: PRINT
320 PRINT TAB(17)"SELECT OPTIONS"
330 PRINT TAB(19)"1. Output Format (1=Short 2=Long 3=Abbreviated)"
340 PRINT TAB(19)"2. Include Table No.? Y/N    Table No."
370 LOCATE 5,47: INPUT;"",A$
380 LOCATE 6,42: INPUT;"",C
390 LOCATE 7,51: INPUT;"",T9
400 LOCATE 8,46: INPUT;"",A1
410 LOCATE 9,44: INPUT;"",T8
420 LOCATE 10,46: INPUT;"",R
```

```
430 LOCATE 11,80: INPUT;"",I1
460 LET B$(1)="SCS TYPE II"
470 LET B$(2)="FARMER-FLETCHER"
475 B$(3)="SCS 6 HOUR"
480 N=19                          :REM NUMBER OF DATA POINTS FOR SCS TYPE II DIST.
490 IF I1=1 THEN LET Z=1  :REM SCS TYPE II
500 IF I1=2 THEN LET Z=2  :REM FARMER-FLETCHER
505 IF I1=3 THEN Z=3      :REM SCS 6 HOUR
510 A=200/C-2
520 D=2*T9/15
530 T7=S=0
540 K=INT(T8/D+2)+15
550 IF I1=1 OR I1=3 THEN GOTO 600 :REM  IF SCS TYPE II OR 6 HR. SKIP TO LINE 600
560 FOR I=1 TO N        :REM   FOR F-F DIST., READ AND DISCARD FIRST SET OF DATA
570 READ T1,P1
580 NEXT I
590 N=11
600 LOCATE 13,17: PRINT"NUMBER OF LINES = ";K
630 LOCATE 16,66: INPUT;"",L1
640 LOCATE 17,45: INPUT;"",Y$
650 IF (Y$<>"Y" AND Y$<>"N") THEN BEEP: GOTO 640
660 IF Y$="Y" THEN LOCATE ,58: INPUT;"",TABLE$
670 F1$="STORM RUNOFF DETERMINATION"
680 F2$="FOR"
690 F3$="INPUT SUMMARY:"
700 F4$="DISTRIBUTION"
710 F5$="RUNOFF AREA"
720 F6$="RAINFALL DEPTH"
730 F7$="RUNOFF CURVE NO."
740 F8$="STORM DURATION"
750 F9$="TIME OF CONCENTRATION"
760 F10$=STRING$(74,61)
770 F11$="HYDROGRAPH ORDINATES:"
780 F12$="TIME"
790 F13$="PPT"
800 F14$="CUM. FLOW"
810 F15$="DEL. FLOW"
820 F16$="FLOW RATE"
830 F17$="(HR)"
840 F18$="(IN)"
850 F19$="(IN/HR)"
860 F20$="(CFS)"
870 F21$="OUTPUT SUMMARY:"
880 F22$="TOTAL RUNOFF DEPTH"
890 F23$="TIME TO PEAK"
900 F24$="INITIAL ABSTRACTION"
910 F25$="RUNOFF VOLUME CHECK"
920 F26$="PEAK FLOW"
930 CLS
940 PRINT TAB(28);F1$
950 PRINT TAB(39);F2$
960 PRINT TAB(40-INT(LEN(A$)/2));A$
```

```
970 PRINT TAB(7);F3$
980 PRINT TAB(4);F10$
990 PRINT TAB(7);F4$;" = ";B$(2);TAB(44);F5$;" = ";A1;" SQ. MILES"
1000 PRINT TAB(7);F6$;" = ";R;" INCHES";TAB(44);F7$;" = ";C
1010 PRINT TAB(7);F8$;" = ";T8;" HOURS";TAB(44);F9$;" = ";T9;" HRS."
1020 PRINT TAB(4);F10$
1030 IF I1=3 THEN GOTO 1032:REM   IF DISTRIBUTION = SCS 6 HR. GOTO LINE 1032
1031 GOTO 1050              :REM   SKIP TO LINE 1050
1032 FOR I=1 TO N :READ T1,P1:NEXT I :REM  READ DATA AND DISCARD
1035 FOR I=1 TO 11 :READ T1,P1:NEXT I   :REM  READ DATA AND DISCARD
1040 N=13                   :REM   SET COUNTER (N) TO 13 FOR SCS 6 HR. DIST.
1050 FOR I=1 TO N
1060 READ T1,P1
1070 T(I)=T8*T1*.01
1080 P(I)=R*P1*.01
1090 NEXT I
1100 LET TJ=0
1110 S1=0
1120 FOR I= 1 TO 6
1130 H(I)=3*TJ/(4*T7^2)
1140 TJ=TJ+D
1150 NEXT I
1160 FOR I=7 TO 14
1170 H(I)=3/(4*T7)*(1-.6*(TJ-T7)/T7)
1180 IF H(I)>=0 THEN GOTO 1200
1190 H(I)=0
1200 TJ=TJ+D
1210 NEXT I
1220 D=0
1225 FLAG=0:FLAGSUM=0
1230 I1=0
1240 T1=0
1250 P1=P(N)
1260 IF T1>=T(N) THEN GOTO 1310
1270 I=1
1280 I=I+1
1290 IF T(I)<T1 THEN GOTO 1280
1300 P1=P(I-1)+(P(I)-P(I-1))*(T1-T(I-1))/(T(I)-T(I-1))
1310 Q0=0
1320 IF P1<A THEN GOTO 1340
1330 Q0=(P1-A)^2/(P1+4*A)
1340 Q1=Q0-Q(3)
1350 Q2=0
1360 S1=Q1
1370 J=14
1380 IF I1>=14 THEN GOTO 1400
1390 J=I1
1400 FOR I=1 TO J
1410 S2=S1
1420 Q2=Q2+H(I)*S2
1430 S1=S(I)
1440 S(I)=S2
```

```
1450 NEXT I
1460 Q3=645.33*A1*Q2
1470 IF Q2<Y(2) THEN GOTO 1520
1480 X=T1
1490 Y(1)=Q(5)
1500 Y(2)=Q2
1510 GOTO 1540
1520 IF X<Q(1) THEN GOTO 1540
1530 Y(3)=Q2
1540 Q(4)=Q1
1550 Q(5)=Q2
1560 Q(6)=Q3
1570 D=D+Q2
1580 IF I1=0 THEN GOTO 1650
1585 IF K>2289 AND I1>=2289 THEN I1=2289:FLAG=1
1600 LOCATE 22,1: PRINT USING"      ##.##     #.##     #.####        #.####
  #.####       ###.##";Q(1),Q(2),Q(3),Q(4),Q(5),Q(6)
1602 G2(I1)=Q(2)
1603 G3(I1)=Q(3)
1604 G4(I1)=Q(4)
1605 G5(I1)=Q(5)
1606 G6(I1)=Q(6)
1650 Q(1)=T1
1660 Q(2)=P1
1670 Q(3)=Q0
1680 T1=T1+D
1685 IF FLAG=1 THEN FLAGSUM=FLAGSUM+1:I1=I1+FLAGSUM
1690 I1=I1+1
1700 IF I1<K THEN GOTO 1250
1710 C1=(Y(1)+Y(3)-2*Y(2))/(2*D*D)
1720 C2=(Y(2)-Y(1)-C1*D*(2*X-3*D))/D
1730 C3=Y(3)-C2*X-C1*X*X
1740 T1=-C2/(2*C1)
1750 Q2=C3-C2*C2/(4*C1)
1760 Q3=645.33*A1*Q2
1770 D=D*D
1790 LOCATE 11,1
1800 PRINT TAB(7);F21$
1810 PRINT TAB(4);F10$
1820 PRINT TAB(7);F22$;" = ";INT(1000*Q(3)+.5)/1000;" IN.";TAB(44);F23$;" = ";IN
T(1000*T1+.5)/1000;" HOURS"
1830 PRINT TAB(7);F24$;" = ";INT(1000*A+.5)/1000;" IN.";TAB(44);F25$;" = ";INT(1
000*D+.5)/1000;" IN."
1840 PRINT TAB(7);F26$;" = ";INT(1000*Q3+.5)/1000;" CFS"
1850 PRINT TAB(4);F10$
1880 LOCATE 24,4: PRINT "CREATE PRINT FILE? Y/N";
1890 LOCATE 24,26: PRINT SPC(2);: LOCATE ,26: INPUT;"",Y$
1900 IF (Y$<>"Y" AND Y$<>"N") THEN BEEP: GOTO 1890
1920 IF Y$="Y" THEN LOCATE ,4: PRINT SPC(50);: LOCATE ,4: PRINT "PLEASE WAIT  FI
LE CREATION IN PROGRESS"
1930 LET Y$="N"
1950 IF Y$="N" THEN LOCATE ,4: PRINT SPC(50);: LOCATE ,4: INPUT;"PRINT COPY? Y/N
 ",Y$
```

```
1960 IF Y$<>"Y" AND Y$<>"N" THEN BEEP: LOCATE ,4: PRINT SPC(50);: LOCATE ,4: INP
UT;"PRINT COPY? Y/N ",Y$
1970 IF Y$="N" THEN GOTO 2160
1980 IF L1=2 OR L1=3 THEN GOTO 2060
2000 LPRINT CHR$(27);CHR$(69)
2010 GOSUB 5010
2020 LPRINT
2030 GOSUB 5190
2040 LBRINT CHR$(27);CHR$(64)
2050 GOTO 2160
2060 LPRINT CHR$(27);CHR$(69):GOSUB 5000
2080 LPRINT
2085 GOSUB 5060
2090 GOSUB 5130
2100 LPRINT CHR$(27);CHR$(70);CHR$(27);CHR$(78)
2105 IF L1=2 THEN 2115
2106 LOCATE 23,1:PRINT SPC(50):LOCATE 24,1:PRINT SPC(50):LOCATE 23,1:PRINT"PRINT
 FLOW RATES FOR 0 TO 1.00, 11.0 TO 13.0, AND >23.0 ?";
2107 LOCATE ,59:INPUT"Y/N";LP2$:IF LP2$<>"Y" AND LP2$<>"N" THEN 2107
2108 IF LP2$="Y" THEN TPN1=1:TPN2=11:TPN3=13:TPN4=23:GOTO 2115
2109 LOCATE 21,1:FOR II=1 TO 4:PRINT SPC(79):PRINT:NEXT II
2110 LOCATE 21,1:PRINT"PRINT DATA FOR TIMES:"
2111 LOCATE 22,21:PRINT"FROM 0.0hrs TO        hrs.":LOCATE 23,21:PRINT"FROM
  hrs TO        hrs.":LOCATE 24,21:PRINT"FROM         hrs TO END."
2112 LOCATE 21,35:INPUT;TPN1:LOCATE 22,26:INPUT;TPN2:LOCATE ,39:INPUT;TPN3:LOCAT
E 23,29:INPUT;TPN4
2115 GG=0:LP=0:LP1=0
2120 FOR ROW = 1 TO K
2122 IF GG >TPN1 AND GG < TPN2 THEN GOTO 2132
2123 IF GG > TPN3 AND GG < TPN4 THEN GOTO 2134
2130 LPRINT USING"      ##.##   ##.##     #.####        #.####       #.####
   ###.##";GG,G2(ROW),G3(ROW),G4(ROW),G5(ROW),G6(ROW)
2131 GOTO 2135
2132 IF LP=0 THEN LPRINT: LP=1
2133 GOTO 2135
2134 IF LP1=0 THEN LPRINT: LP1=1
2135 GG=GG+0
2140 NEXT ROW
2150 GOSUB 5190
2160 END
5000 REM ****************** PRINT SUBROUTINES ********************************
5010 LPRINT TAB(38-INT(LEN(TABLE$)/2));"TABLE ";TABLE$
5020 LPRINT
5030 LPRINT TAB(28);F1$: LPRINT TAB(39);F2$
5040 LPRINT TAB(40-INT(LEN(A$)/2));A$
5050 RETURN
5060 LPRINT TAB(7);F3$: LPRINT TAB(4);F10$
5070 LPRINT TAB(7);F4$;" = ";B$(2);TAB(44);F5$;" = ";A1;" SQ. MILES"
5080 LPRINT TAB(7);F6$;" = ";R;" INCHES";TAB(44);F7$;" = ";C
5090 LPRINT TAB(7);F8$;" = ";T8;" HOURS";TAB(44);F9$;" = ";T9;" HRS."
5100 LPRINT TAB(4);F10$
```

```
5130 LPRINT TAB(7);F11$: LPRINT TAB(4);F10$
5140 LPRINT TAB(7);F12$;TAB(16);F13$;TAB(24);F14$;TAB(38);F15$;TAB(52);F16$;TAB(
66);F16$
5150 LPRINT TAB(7);F17$;TAB(16);F18$;TAB(26);F18$;TAB(40);F18$;TAB(53);F19$;TAB(
68);F20$
5160 LPRINT TAB(4);F10$
5170 RETURN
5190 REM OUTPUT SUMMARY
5191 LPRINT TAB(7);F21$: LPRINT TAB(4);F10$
5200 LPRINT TAB(7);F22$;" = ";INT(1000*Q(3)+.5)/1000;" IN.";TAB(44);F23$;" = ";I
NT(1000*T1+.5)/1000;" HOURS"
5210 LPRINT TAB(7);F24$;" = ";INT(1000*A+.5)/1000;" IN.";TAB(44);F25$;" = ";INT(
1000*O+.5)/1000;" IN."
5220 LPRINT TAB(7);F26$;" = ";INT(1000*Q3+.5)/1000;" CFS"
5230 LPRINT TAB(4);F10$
5240 RETURN
```

TABLE 3

STORM RUNOFF DETERMINATION
FOR
dbd haul road #3

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR	RUNOFF AREA = .47 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 85
STORM DURATION = 5 HOURS	TIME OF CONCENTRATION = .361 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.02	1.20	0.2744	0.0526	0.5143	156.00
2.07	1.29	0.3270	0.0261	0.6197	187.95
2.12	1.34	0.3530	0.0150	0.7040	213.54
2.17	1.36	0.3681	0.0152	0.7564	229.42
2.21	1.39	0.3833	0.0154	0.7733	234.54
2.26	1.41	0.3987	0.0156	0.7515	227.94
2.31	1.44	0.4143	0.0158	0.6895	209.12
2.36	1.47	0.4301	0.0159	0.6174	187.27

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .945 IN.	TIME TO PEAK = 2.211 HOURS
INITIAL ABSTRACTION = .353 IN.	RUNOFF VOLUME CHECK = .946 IN.
PEAK FLOW = 234.564 CFS	

TABLE 4

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #4

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR	RUNOFF AREA = .069 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 83.5
STORM DURATION = 6 HOURS	TIME OF CONCENTRATION = .125 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.37	1.10	0.1866	0.0126	0.6343	28.25
2.38	1.13	0.1992	0.0129	0.6554	29.18
2.40	1.16	0.2120	0.0131	0.6758	30.09
2.42	1.18	0.2252	0.0134	0.6956	30.97
2.43	1.21	0.2386	0.0137	0.7148	31.83
2.45	1.24	0.2523	0.0139	0.7334	32.66
2.47	1.27	0.2662	0.0142	0.7514	33.46
2.48	1.29	0.2804	0.0144	0.7689	34.24
2.50	1.32	0.2948	0.0040	0.7859	34.99
2.52	1.33	0.2988	0.0040	0.7831	34.87
2.53	1.33	0.3027	0.0040	0.7602	33.85
2.55	1.34	0.3067	0.0040	0.7167	31.91
2.57	1.35	0.3107	0.0040	0.6524	29.05
2.58	1.36	0.3147	0.0040	0.5670	25.25
2.60	1.36	0.3187	0.0040	0.4908	21.86
2.62	1.37	0.3227	0.0041	0.4243	18.89
2.63	1.38	0.3268	0.0041	0.3678	16.38
2.65	1.39	0.3309	0.0041	0.3215	14.31

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OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .862 IN.	TIME TO PEAK = 2.506 HOURS
INITIAL ABSTRACTION = .395 IN.	RUNOFF VOLUME CHECK = .863 IN.
PEAK FLOW = 35.053 CFS	

TABLE 5

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #5

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS

RUNOFF AREA = .02 SQ. MILES
RUNOFF CURVE NO. = 80
TIME OF CONCENTRATION = .171 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.37	1.11	0.1198	0.0134	0.4156	5.36
2.39	1.15	0.1332	0.0140	0.4462	5.76
2.42	1.18	0.1471	0.0145	0.4757	6.14
2.44	1.22	0.1616	0.0150	0.5041	6.51
2.46	1.26	0.1767	0.0155	0.5315	6.86
2.49	1.30	0.1922	0.0119	0.5578	7.20
2.51	1.32	0.2041	0.0044	0.5778	7.46
2.53	1.33	0.2084	0.0044	0.5810	7.50
2.55	1.34	0.2128	0.0044	0.5669	7.32
2.58	1.35	0.2173	0.0045	0.5350	6.90
2.60	1.36	0.2217	0.0045	0.4848	6.26
2.62	1.37	0.2263	0.0045	0.4246	5.48
2.64	1.38	0.2308	0.0046	0.3706	4.78

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .688 IN.
INITIAL ABSTRACTION = .5 IN.
PEAK FLOW = 7.51 CFS

TIME TO PEAK = 2.524 HOURS
RUNOFF VOLUME CHECK = .689 IN.

TABLE 6

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #6

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR	RUNOFF AREA = .007 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 76
STORM DURATION = 6 HOURS	TIME OF CONCENTRATION = .137 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.36	1.09	0.0572	0.0072	0.2584	1.17
2.37	1.12	0.0644	0.0076	0.2818	1.27
2.39	1.15	0.0720	0.0079	0.3047	1.38
2.41	1.18	0.0799	0.0083	0.3269	1.48
2.43	1.21	0.0882	0.0086	0.3486	1.57
2.45	1.23	0.0968	0.0089	0.3698	1.67
2.47	1.26	0.1057	0.0093	0.3904	1.76
2.48	1.29	0.1150	0.0086	0.4106	1.85
2.50	1.32	0.1236	0.0026	0.4286	1.94
2.52	1.33	0.1262	0.0027	0.4343	1.96
2.54	1.34	0.1289	0.0027	0.4272	1.93
2.56	1.35	0.1315	0.0027	0.4067	1.84
2.58	1.35	0.1342	0.0027	0.3726	1.68
2.59	1.36	0.1370	0.0027	0.3270	1.48
2.61	1.37	0.1397	0.0028	0.2859	1.29
2.63	1.38	0.1425	0.0028	0.2497	1.13
2.65	1.39	0.1453	0.0028	0.2188	0.99

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .52 IN.	TIME TO PEAK = 2.52 HOURS
INITIAL ABSTRACTION = .632 IN.	RUNOFF VOLUME CHECK = .522 IN.
PEAK FLOW = 1.962 CFS	

TABLE 7

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #7

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .095 SQ. MILES
RUNOFF CURVE NO. = 80.8
TIME OF CONCENTRATION = .247 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.40	1.16	0.1547	0.0219	0.4143	25.40
2.44	1.22	0.1767	0.0230	0.4606	28.24
2.47	1.27	0.1997	0.0224	0.5043	30.91
2.50	1.32	0.2221	0.0066	0.5441	33.36
2.54	1.34	0.2288	0.0067	0.5650	34.64
2.57	1.35	0.2355	0.0068	0.5663	34.72
2.60	1.36	0.2423	0.0069	0.5475	33.56
2.63	1.38	0.2491	0.0069	0.5079	31.14
2.67	1.39	0.2561	0.0070	0.4494	27.55

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .725 IN.
INITIAL ABSTRACTION = .475 IN.
PEAK FLOW = 34.833 CFS
TIME TO PEAK = 2.554 HOURS
RUNOFF VOLUME CHECK = .727 IN.

TABLE 8

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #8

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .014 SQ. MILES
RUNOFF CURVE NO. = 76
TIME OF CONCENTRATION = .214 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.43	1.20	0.0863	0.0135	0.2695	2.44
2.45	1.24	0.0997	0.0143	0.3054	2.76
2.48	1.29	0.1140	0.0108	0.3399	3.07
2.51	1.32	0.1248	0.0041	0.3686	3.33
2.54	1.34	0.1289	0.0042	0.3838	3.47
2.57	1.35	0.1331	0.0042	0.3849	3.48
2.60	1.36	0.1374	0.0043	0.3711	3.35
2.63	1.38	0.1417	0.0044	0.3421	3.09
2.65	1.39	0.1460	0.0044	0.3042	2.75
2.68	1.40	0.1504	0.0045	0.2695	2.43

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .52 IN.
INITIAL ABSTRACTION = .632 IN.
PEAK FLOW = 3.49 CFS
TIME TO PEAK = 2.556 HOURS
RUNOFF VOLUME CHECK = .522 IN.

TABLE 9

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #9

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR   RUNOFF AREA = 8.000001E-03 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES   RUNOFF CURVE NO. = 87
STORM DURATION = 6 HOURS   TIME OF CONCENTRATION = .25 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.43	1.21	0.3460	0.0338	0.7935	4.10
2.47	1.27	0.3798	0.0347	0.8357	4.31
2.50	1.32	0.4145	0.0095	0.8749	4.52
2.53	1.33	0.4241	0.0096	0.8878	4.58
2.57	1.35	0.4336	0.0096	0.8741	4.51
2.60	1.36	0.4433	0.0097	0.8335	4.30
2.63	1.38	0.4530	0.0098	0.7655	3.95
2.67	1.39	0.4627	0.0098	0.6698	3.46
2.70	1.41	0.4725	0.0099	0.5836	3.01

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.064 IN.   TIME TO PEAK = 2.533 HOURS
INITIAL ABSTRACTION = .299 IN.   RUNOFF VOLUME CHECK = 1.067 IN.
PEAK FLOW = 4.583 CFS

TABLE 10

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #10

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .248 SQ. MILES
RUNOFF CURVE NO. = 79.6
TIME OF CONCENTRATION = .526 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.52	1.33	0.1981	0.0133	0.2542	40.69
2.59	1.36	0.2114	0.0136	0.3092	49.48
2.67	1.39	0.2250	0.0139	0.3485	55.77
2.74	1.42	0.2389	0.0142	0.3681	58.91
2.81	1.45	0.2531	0.0145	0.3646	58.36
2.88	1.49	0.2676	0.0148	0.3435	54.98
2.95	1.52	0.2824	0.0144	0.3198	51.19

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .67 IN.
INITIAL ABSTRACTION = .513 IN.
PEAK FLOW = 59.141 CFS
TIME TO PEAK = 2.76 HOURS
RUNOFF VOLUME CHECK = .671 IN.

TABLE 11

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #11

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .024 SQ. MILES
RUNOFF CURVE NO. = 73
TIME OF CONCENTRATION = .644 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.58	1.35	0.0873	0.0102	0.0809	1.25
2.66	1.39	0.0976	0.0107	0.1119	1.73
2.75	1.43	0.1083	0.0112	0.1384	2.14
2.83	1.47	0.1194	0.0116	0.1557	2.41
2.92	1.50	0.1311	0.0119	0.1597	2.47
3.01	1.54	0.1430	0.0100	0.1609	2.49
3.09	1.57	0.1529	0.0102	0.1597	2.47
3.18	1.60	0.1631	0.0105	0.1562	2.42
3.26	1.63	0.1736	0.0107	0.1501	2.32
3.35	1.66	0.1844	0.0110	0.1420	2.20
3.43	1.69	0.1953	0.0104	0.1336	2.07

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.
INITIAL ABSTRACTION = .74 IN.
PEAK FLOW = 2.491 CFS
TIME TO PEAK = 3.005 HOURS
RUNOFF VOLUME CHECK = .414 IN.

TABLE 12

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #12

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .105 SQ. MILES
RUNOFF CURVE NO. = 73
TIME OF CONCENTRATION = .8 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.56	1.35	0.0855	0.0127	0.0505	3.42
2.67	1.39	0.0982	0.0134	0.0781	5.29
2.77	1.44	0.1116	0.0141	0.1066	7.22
2.88	1.49	0.1257	0.0148	0.1297	8.79
2.99	1.53	0.1405	0.0127	0.1420	9.62
3.09	1.57	0.1532	0.0127	0.1466	9.93
3.20	1.61	0.1659	0.0131	0.1491	10.10
3.31	1.65	0.1791	0.0135	0.1493	10.11
3.41	1.69	0.1926	0.0131	0.1469	9.95

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.
INITIAL ABSTRACTION = .74 IN.
PEAK FLOW = 10.13 CFS
TIME TO PEAK = 3.26 HOURS
RUNOFF VOLUME CHECK = .414 IN.

TABLE 13

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #13

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .066 SQ. MILES
RUNOFF CURVE NO. = 73
TIME OF CONCENTRATION = .857 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.51	1.33	0.0802	0.0133	0.0358	1.53
2.63	1.38	0.0935	0.0141	0.0604	2.57
2.74	1.43	0.1076	0.0149	0.0884	3.77
2.86	1.48	0.1225	0.0157	0.1149	4.89
2.97	1.53	0.1382	0.0140	0.1335	5.68
3.09	1.57	0.1522	0.0136	0.1397	5.95
3.20	1.61	0.1658	0.0141	0.1440	6.13
3.31	1.65	0.1799	0.0145	0.1460	6.22
3.43	1.69	0.1945	0.0132	0.1456	6.20
3.54	1.73	0.2077	0.0105	0.1421	6.05
3.66	1.75	0.2182	0.0107	0.1355	5.77

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.
INITIAL ABSTRACTION = .74 IN.
PEAK FLOW = 6.225 CFS
TIME TO PEAK = 3.352 HOURS
RUNOFF VOLUME CHECK = .414 IN.

TABLE GW A

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD GRIMES WASH A

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = 2.531 SQ. MILES
RUNOFF CURVE NO. = 66
TIME OF CONCENTRATION = 1.763 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.12	0.69	0.0000	0.0004	0.0000	0.00
2.35	1.08	0.0004	0.0191	0.0001	0.09
2.59	1.36	0.0196	0.0137	0.0026	4.17
2.82	1.46	0.0333	0.0161	0.0068	11.10
3.06	1.56	0.0493	0.0157	0.0131	21.38
3.29	1.64	0.0650	0.0169	0.0214	34.93
3.53	1.72	0.0819	0.0131	0.0318	51.87
3.76	1.78	0.0950	0.0139	0.0399	65.16
4.00	1.84	0.1090	0.0134	0.0470	76.79
4.23	1.89	0.1224	0.0140	0.0526	85.85
4.47	1.94	0.1364	0.0121	0.0567	92.60
4.70	1.98	0.1485	0.0121	0.0589	96.23
4.94	2.02	0.1606	0.0125	0.0600	98.01
5.17	2.07	0.1731	0.0129	0.0598	97.75
5.41	2.11	0.1860	0.0122	0.0586	95.74
5.64	2.14	0.1982	0.0119	0.0571	93.21
5.88	2.18	0.2101	0.0063	0.0558	91.06

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .216 IN.
INITIAL ABSTRACTION = 1.03 IN.
PEAK FLOW = 98.154 CFS
TIME TO PEAK = 5.024 HOURS
RUNOFF VOLUME CHECK = .217 IN.

TABLE GW B

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD GRIMES WASH B

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR	RUNOFF AREA = 2.181 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 73
STORM DURATION = 6 HOURS	TIME OF CONCENTRATION = 1.244 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.16	0.76	0.0001	0.0211	0.0000	0.03
2.32	1.03	0.0212	0.0526	0.0039	5.42
2.49	1.30	0.0738	0.0228	0.0172	24.21
2.65	1.39	0.0966	0.0210	0.0347	48.80
2.82	1.46	0.1176	0.0227	0.0559	78.74
2.99	1.53	0.1403	0.0198	0.0813	114.41
3.15	1.59	0.1601	0.0203	0.1041	146.53
3.32	1.65	0.1804	0.0213	0.1154	162.39
3.48	1.71	0.2017	0.0159	0.1239	174.38
3.65	1.75	0.2175	0.0156	0.1292	181.86
3.81	1.79	0.2332	0.0160	0.1308	184.06
3.98	1.83	0.2492	0.0151	0.1295	182.30
4.15	1.87	0.2643	0.0152	0.1251	176.10
4.31	1.91	0.2795	0.0156	0.1173	165.11
4.48	1.94	0.2950	0.0131	0.1093	153.78
4.64	1.97	0.3081	0.0129	0.1036	145.85
4.81	2.00	0.3210	0.0131	0.0992	139.67
4.98	2.03	0.3341	0.0132	0.0952	133.97

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.	TIME TO PEAK = 3.824 HOURS
INITIAL ABSTRACTION = .74 IN.	RUNOFF VOLUME CHECK = .414 IN.
PEAK FLOW = 184.069 CFS	

TABLE GW C

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD GRIMES WASH C

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR	RUNOFF AREA = 1.64 SQ. MILES
RAINFALL DEPTH = 2.2 INCHES	RUNOFF CURVE NO. = 83.5
STORM DURATION = 6 HOURS	TIME OF CONCENTRATION = .822 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.08	0.64	0.0270	0.0477	0.0091	9.63
2.19	0.82	0.0747	0.0658	0.0295	31.27
2.30	1.00	0.1405	0.0804	0.0680	71.95
2.41	1.18	0.2208	0.0789	0.1278	135.27
2.52	1.33	0.2997	0.0264	0.2078	219.90
2.63	1.38	0.3261	0.0271	0.2852	301.84
2.74	1.43	0.3531	0.0277	0.3491	369.51
2.85	1.47	0.3809	0.0284	0.3919	414.73
2.96	1.52	0.4092	0.0253	0.4072	430.91
3.07	1.56	0.4345	0.0235	0.3948	417.86
3.18	1.60	0.4581	0.0239	0.3774	399.41
3.29	1.64	0.4819	0.0242	0.3548	375.51
3.40	1.68	0.5062	0.0241	0.3272	346.25
3.51	1.72	0.5303	0.0171	0.2963	313.59
3.62	1.74	0.5473	0.0172	0.2655	280.97
3.73	1.77	0.5646	0.0174	0.2389	252.82
3.84	1.80	0.5819	0.0175	0.2190	231.75
3.95	1.82	0.5995	0.0168	0.2063	218.31
4.06	1.85	0.6163	0.0162	0.1949	206.23
4.16	1.87	0.6325	0.0163	0.1848	195.57
4.27	1.90	0.6487	0.0164	0.1761	186.42
4.38	1.92	0.6651	0.0165	0.1690	178.85
4.49	1.95	0.6816	0.0135	0.1630	172.52
4.60	1.97	0.6951	0.0133	0.1573	166.47
4.71	1.98	0.7084	0.0134	0.1520	160.92
4.82	2.00	0.7218	0.0135	0.1473	155.90
4.93	2.02	0.7353	0.0135	0.1430	151.38

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .862 IN.	TIME TO PEAK = 2.965 HOURS
INITIAL ABSTRACTION = .395 IN.	RUNOFF VOLUME CHECK = .863 IN.
PEAK FLOW = 430.955 CFS	

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TABLE GW D

STORM RUNOFF DETERMINATION FOR DBD HAUL ROAD GRIMES WASH D

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS
RUNOFF AREA = .935 SQ. MILES
RUNOFF CURVE NO. = 87
TIME OF CONCENTRATION = .452 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.05	0.59	0.0463	0.0327	0.0527	31.77
2.11	0.68	0.0789	0.0392	0.0840	50.71
2.17	0.78	0.1181	0.0447	0.1316	79.43
2.23	0.88	0.1628	0.0496	0.1977	119.30
2.29	0.98	0.2124	0.0537	0.2842	171.49
2.35	1.08	0.2661	0.0574	0.3799	229.25
2.41	1.17	0.3236	0.0607	0.4785	288.73
2.47	1.27	0.3842	0.0392	0.5766	347.93
2.53	1.33	0.4234	0.0174	0.6594	397.86
2.59	1.36	0.4408	0.0175	0.7123	429.77
2.65	1.39	0.4584	0.0177	0.7322	441.83x
2.71	1.41	0.4761	0.0179	0.7167	432.43
2.77	1.44	0.4940	0.0181	0.6632	400.18
2.83	1.47	0.5121	0.0182	0.5925	357.50
2.89	1.49	0.5303	0.0184	0.5257	317.20
2.95	1.52	0.5487	0.0177	0.4652	280.67
3.01	1.54	0.5664	0.0150	0.4121	248.68
3.07	1.57	0.5814	0.0150	0.3666	221.21
3.13	1.59	0.5965	0.0151	0.3298	199.01
3.19	1.61	0.6116	0.0152	0.3028	182.72
3.25	1.63	0.6268	0.0153	0.2865	172.90
3.31	1.65	0.6422	0.0154	0.2776	167.51
3.37	1.67	0.6576	0.0155	0.2718	164.00
3.44	1.69	0.6731	0.0156	0.2669	161.07
3.50	1.71	0.6886	0.0111	0.2631	158.72
3.56	1.73	0.6998	0.0108	0.2579	155.61
3.62	1.74	0.7106	0.0108	0.2513	151.63
3.68	1.76	0.7214	0.0109	0.2432	146.77
3.74	1.77	0.7323	0.0109	0.2337	141.04
3.80	1.79	0.7432	0.0109	0.2226	134.33
3.86	1.80	0.7541	0.0110	0.2128	128.43
3.92	1.82	0.7651	0.0110	0.2044	123.34
3.98	1.83	0.7761	0.0104	0.1973	119.07

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.064 IN.
INITIAL ABSTRACTION = .299 IN.
PEAK FLOW = 441.871 CFS
TIME TO PEAK = 2.655 HOURS
RUNOFF VOLUME CHECK = 1.067 IN.

TABLE GW E

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD GRIMES WASH E

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS

RUNOFF AREA = .194 SQ. MILES
RUNOFF CURVE NO. = 73
TIME OF CONCENTRATION - .873 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.10	0.66	0.0000	0.0032	0.0000	0.00
2.21	0.85	0.0032	0.0193	0.0008	0.01
2.33	1.04	0.0225	0.0347	0.0066	0.83
2.44	1.30	0.0573	0.0283	0.0214	2.68
2.56	1.35	0.0856	0.0139	0.0435	5.44
2.68	1.40	0.0995	0.0147	0.0691	8.65
2.79	1.50	0.1142	0.0156	0.0972	12.17
3.03	1.55	0.1454	0.0136	0.1352	16.92
3.26	1.63	0.1732	0.0146	0.1445	18.09
3.38	1.67	0.1878	0.0151	0.1458	18.25
3.49	1.71	0.2028	0.0110	0.1446	18.10
3.61	1.74	0.2138	0.0108	0.1397	17.49
3.72	1.77	0.2246	0.0110	0.1324	16.57
3.84	1.80	0.2357	0.0112	0.1242	15.55

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.
INITIAL ABSTRACTION = .74 IN.
PEAK FLOW = 18.254 CFS

TIME TO PEAK = 3.377 HOURS
RUNOFF VOLUME CHECK = .414 IN.

TABLE 15

STORM RUNOFF DETERMINATION
FOR
DBD HAUL ROAD #15

INPUT SUMMARY:

DISTRIBUTION = SCS 6 HOUR
RAINFALL DEPTH = 2.2 INCHES
STORM DURATION = 6 HOURS

RUNOFF AREA = .082 SQ. MILES
RUNOFF CURVE NO. = 73
TIME OF CONCENTRATION = .968 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
2.58	1.36	0.0880	0.0156	0.0398	2.11
2.71	1.41	0.1036	0.0167	0.0639	3.38
2.84	1.47	0.1202	0.0177	0.0912	4.82
2.97	1.53	0.1379	0.0158	0.1152	6.10
3.10	1.57	0.1537	0.0155	0.1286	6.81
3.23	1.62	0.1692	0.0161	0.1352	7.16
3.36	1.67	0.1852	0.0166	0.1398	7.40
3.48	1.71	0.2019	0.0124	0.1420	7.51
3.61	1.74	0.2143	0.0120	0.1405	7.43
3.74	1.77	0.2263	0.0123	0.1360	7.19
3.87	1.81	0.2386	0.0125	0.1287	6.81

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = .413 IN.
INITIAL ABSTRACTION = .74 IN.
PEAK FLOW = 7.514 CFS

TIME TO PEAK = 3.498 HOURS
RUNOFF VOLUME CHECK = .414 IN.

```
1 REM          ************************************************************
2 CLS : REM    *              RIPRAP SIZING PROGRAM TAKEN FROM
3 KEY OFF:REM  *  "APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS"
4 REM:         *            BY BARFEILD, WARNER AND HAAN.  PAGE 185
5 REM          ************************************************************
30 DEF FNSIND(I)=SIN(I*3.14159/180)
40 DEF FNCOSD(I)=COS(I*3.14159/180)
50 DEF FNTAND(I)=TAN(I*3.14159/180)
60 DEF FNATND(I)=(180/3.14159)*ATN(I)
100 PRINT TAB(13)"R I P R A P   S I Z I N G   F O R"
110 PRINT TAB(11)"T R A P A Z O I D A L   D I T C H E S "
120 PRINT
130 PRINT TAB(13)"ENTER LISTED PARAMETERS"
140 PRINT TAB(13)"1. FLOW RATE (CFS)"
150 PRINT TAB(13)"2. CHANNEL SLOPE"
160 PRINT TAB(13)"3. BOTTOM WIDTH (FT)"
170 PRINT TAB(13)"4. SIDE SLOPE"
180 PRINT TAB(13)"5. PHI ANGLE"
190 PRINT TAB(13)"6. SPECIFIC GRAVITY OF RIPRAP"
195 PRINT
300 LOCATE 5,32:INPUT;"",Q
310 LOCATE 6,30:INPUT;"",S
320 LOCATE 7,34:INPUT;"",B
330 LOCATE 8,27:INPUT;"",SS
340 LOCATE 9,26:INPUT;"",PHI
350 LOCATE 10,43:INPUT;"",SG
360 LOCATE 12,13:INPUT;"DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM  ",DSF
370 LOCATE 13,13:INPUT;"DESIRED SAFETY FACTOR FOR CHANNEL BANKS   ",DSFB
400 SA=FNATND(S) :SSA=FNATND(SS)
480 D50=1: D=1
490 Q=INT(Q*1000+.5)/1000
500 N=((D50)^(1/6))*(.0395)
503 D50=INT(D50*10000+.5)/10000
505 Q1=1.49*(S^.5)/N
508 A=B*D+D*D/SS
510 Q2=Q1*A^(5/3)/(B+2*D*(1+1/(SS^2))^(.5))^(2/3)
512 Q3=INT(Q2*1000+.5)/1000
514 IF Q3=Q GOTO 520
515 IF Q3>=Q-.001 AND Q3<=Q+.001 THEN 520
516 D=(Q/Q2*D+D)/2
518 GOTO 505
520 T=62.4*D*S
525 VEL=Q/A
526 VEL=INT(VEL*1000+.5)/1000 :D=INT(D*1000+.5)/1000
530 NU=21*T/(62.4*(SG-1)*D50)
540 SF=FNCOSD(SA)*FNTAND(PHI)/(FNSIND(SA)+NU*FNTAND(PHI))
600 REM LAMBDA = CHANNEL SLOPE ANGLE SA
605 NU=.76*NU : REM ASSUME Tmax = .76*t AND NU(BANK)=.76*NU
610 BETA=FNATND(FNCOSD(SA)/(2*FNSIND(SSA)/(NU*FNTAND(PHI))+FNSIND(SA)))
620 NUP=NU*(1+FNSIND(SA+BETA))/2
630 SFB=FNCOSD(SSA)*FNTAND(PHI)/(NUP*FNTAND(PHI)+FNSIND(SSA)*FNCOSD(BETA))
700 SF=INT(SF*1000+.5)/1000
710 SFB=INT(SFB*1000+.5)/1000
720 LOCATE 16,10:PRINT"VELOCITY      DEPTH        D50        S.F. BTM        S.F. BA
730 LOCATE 17,11:PRINT VEL;"       ";D;"    ";D50;"        ";SF;"         ";SFB;"
740 IF SFB=0 GOTO 815
750 IF SFB=DSFB GOTO 800
760 D50=(DSFB/SFB*D50+D50)/2
```

SUPERSEDED
EFFECTIVE:
SEP 01 1998

4-44

EXHIBIT IV
UTAH DIVISION OIL, GAS AND MINING

```
765 K=K+1:IF K=100 THEN GOTO 860
767 LOCATE 20,13:PRINT K
770 GOTO 500
800 IF SF>=DSF GOTO 820
810 LOCATE 20,13:PRINT"ERRROR: SF BANK > SF BTM":END
815 LOCATE 20,13:PRINT"ERROR: SFB=0": END
820 LOCATE 20,13:PRINT"RUN COMPLETE"
850 END
860 PRINT"Exceeds allowable number of iterations (see line 765)":END
```

SUPERSEDED
EFFECTIVE:
SEP 01 1998

R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 235
2. CHANNEL SLOPE .105
3. BOTTOM WIDTH (FT) 20
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
9.779	1.039	2.5492	1.505	1.5

RUN COMPLETE

Ok

SUPERSEDED
EFFECTIVE:
SEP 01 1998

4-46

EXHIBIT V
CHANNEL #3

UTAH DIVISION OIL, GAS AND MINING

R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 35.1
2. CHANNEL SLOPE .127
3. BOTTOM WIDTH (FT) 12
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.53

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
6.611	.402	1.2544	1.508	1.53

RUN COMPLETE

Ok

SUPERSEDED
EFFECTIVE:
SEP 01 1998
UTAH DIVISION OIL, GAS AND MINING

4-47

CHANNEL #4

R I P R A P   S I Z I N G   F O R
T R A P A Z O I D A L   D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 7.5
2. CHANNEL SLOPE .15
3. BOTTOM WIDTH (FT) 8
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.55

VELOCITY	DEPTH	D5Ø	S.F. BTM	S.F. BANK
4.778	.184	.7Ø35	1.492	1.55

ERRROR: SF BANK > SF BTM

Ok

CHANNEL #5

RIPRAP SIZING FOR
TRAPAZOIDAL DITCHES

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 34.6
2. CHANNEL SLOPE .045
3. BOTTOM WIDTH (FT) 6
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
5.752	.737	.7508	1.633	1.5

RUN COMPLETE

Ok

SUPERSEDED
EFFECTIVE:
SEP 01 1998

UTAH DIVISION OIL, GAS AND MINING

CHANNEL #7

R I P R A P   S I Z I N G   F O R
T R A P A Z O I D A L   D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 3.5
2. CHANNEL SLOPE .15
3. BOTTOM WIDTH (FT) 6
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.55

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
4.084	.134	.513	1.492	1.55

ERRROR: SF BANK > SF BTM

Ok

4-50

CHANNEL #8

R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 59.1
2. CHANNEL SLOPE .Ø6
3. BOTTOM WIDTH (FT) 12
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D5Ø	S.F. BTM	S.F. BANK
6.447	.656	.899	1.6	1.5

RUN COMPLETE

Ok

4-51

CHANNEL #10

R I P R A P   S I Z I N G   F O R
T R A P A Z O I D A L   D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 2.5
2. CHANNEL SLOPE .Ø12
3. BOTTOM WIDTH (FT) 4
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D5Ø	S.F. BTM	S.F. BANK	
2.254	.236	.Ø63	1.711	1.5Ø2	5Ø8

97

RIPRAP SIZING FOR
TRAPAZOIDAL DITCHES

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 10.1
2. CHANNEL SLOPE .06
3. BOTTOM WIDTH (FT) 3
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
4.263	.269	.3686	1.6	1.5

RUN COMPLETE

Ok

RIPRAP SIZING FOR
TRAPAZOIDAL DITCHES

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 6.2
2. CHANNEL SLOPE .095
3. BOTTOM WIDTH (FT) 6
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
4.391	.213	.4699	1.526	1.5

RUN COMPLETE

Ok

4-54

CHANNEL #13

R I P R A P   S I Z I N G   F O R
T R A P A Z O I D A L   D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 835
2. CHANNEL SLOPE .073
3. BOTTOM WIDTH (FT) 30
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.11

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
12.489	1.876	1.9194	1.008	1.11

RUN COMPLETE

Ok

4-55

CHANNEL #14

R I P R A P   S I Z I N G   F O R
T R A P A Z O I D A L   D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 7.5
2. CHANNEL SLOPE .Ø6
3. BOTTOM WIDTH (FT) 6
4. SIDE SLOPE .333
5. PHI ANGLE 42
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D5Ø	S.F. BTM	S.F. BANK
4.162	.265	.3633	1.6	1.5

RUN COMPLETE

Ok

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4-56
SEP 01 1998
CHANNEL #15

```
01♦LBL "JJ"
02 1
03 STO 00
04 "L=?"
05 PROMPT
06 STO 06
07 "W=?"
08 PROMPT
09 STO 01
10 "N=?"
11 PROMPT
12 STO 07
13 "Q=?"
14 PROMPT
15 STO 05
16 .02349
17 *
18 "S=?"
19 PROMPT
20 STO 04
21 SQRT
22 /
23 1
24 -
25 STO 02
26♦LBL 02
27 XEQ "DD"
28 RCL 03
29 100
30 *
31 .5
32 +
33 INT
34 100
35 X=Y?
36 GTO 04
37 CF 01
38 CF 02
39 RCL 03
40 X>0?
41 SF 01
42 FS? 01
43 GTO 03
44 -1
45 RCL 03
46 X<Y?
47 SF 02
48 2
49 FS? 02
50 CHS
51 +
52♦LBL 03
53 ABS
54 LOG
55 .1
56 *
57 FS? 01
58 CHS
59 FS? 03
60 XEQ 05
61 ST+ 00
62 GTO 02
63♦LBL 04
64 CLA
65 "d="
66 "├"
67 ARCL 00
68 AVIEW
69 RCL 08
70 RCL 06
71 *
72 RCL 05
73 /
74 3600
75 /
76 "T="
77 "├"
78 ARCL X
79 AVIEW
80 STOP
81 XEQ "JJ"
82♦LBL 05
83 RCL 00
84 X↑2
85 /
86 RTN
87 END
```

```
01♦LBL "DD"
02 CF 03
03 1
04 RCL 00
05 X>Y?
06 SF 03
07 ENTER↑
08 X↑2
09 FS? 03
10 GTO 02
11 2
12 *
13 X<>Y
14 RCL 07
15 *
16 +
17 STO 08
18 1.667
19 Y↑X
20 RCL 00
21 4.472
22 *
23 RCL 07
24 +
25 GTO 04
26♦LBL 02
27 3
28 *
29 X<>Y
30 RCL 01
31 *
32 +
33 RCL 07
34 +
35 1
36 +
37 STO 08
38 1.667
39 Y↑X
40 RCL 00
41 6.324
42 *
43 RCL 01
44 +
45 5.852
46 -
47♦LBL 04
48 -.667
49 Y↑X
50 *
51 RCL 02
52 -
53 ENTER↑
54 X<> 03
55 CLA
56 ARCL 00
57 "├  "
58 ARCL 03
59 AVIEW
60 RTN
61 END
```

<u>HP41CV</u> <u>Routine</u>
to solve for
Depth of Flow and
Travel Time

EXHIBIT III

REVEGETATION (R614-301-353)

Interim Stabilization And Vegetation Plan

There are five major fills at the Des Bee Dove Mine with bare open slopes generally with a south or southeast aspect. With the proposed reclamation plan one fill would provide some soil material for the final contouring and grading. Because no topsoil was stockpiled and the native soils on these steep slopes provide very little topsoil material the fill material would need to become the planting medium. An off-site source is impractical. The fill material was tested in 1980 and again in 1983 for its physical and chemical properties.

The soil material in the fills is comparable to surrounding native soils and was originally derived from sandstone and shale parent materials. The soil material particles are mostly sand with textures from sandy clay loams to sandy loams (Table I). The water holding capacity is low, typical of sandy soils.

They are calcerous soils as indiated by pH's of 7.5-8.5 and calcium carbonate equivalents above eight percent (Table II). Salt content is too low for any harmful affects on plants. Potassium, phosphates and nitrogen, important plant nutrients, are very low indicating the need for fertilization to insure plant growth. The organic material is principally coal debris, the nitrogen percentage ratio is too low.

TABLE I: SOILS PHYSICAL PROPERTIES

Sample #	Year	Identification	Sand	Silt	Clay	Texture	pH	Saturation %	Ece
1107[1]	1980	0-4"	52	33	15	SL	8.3		0.8
1108	1980	4-12"	50	33	17	SL	8.1		0.5
1109	1980	12-24"	54	31	15	SL	8.3		0.4
1110	1980	Surface Wash	52	33	15	SL	8.1		0.3
1111	1980	Subsoil	59	27	14	SL	8.0		2.1
1117	1980	Coal Waste					10.0		2.1
1118	1980	Coal Waste					7.1		2.5
1119	1980	Coal Waste					7.5		2.5
DBD#1[2]	1983	Upper Fill	65	13	22	SCL	8.2	30	.40
DBD#2	1983	Bathhouse Fill	59	11	30	SCL	8.8	20	.70
DBD#3	1983	Tipple Fill	65	17	18	SL	8.5	30	.72

[1] Soil and spoil from Des-Bee-Dove Mine

[2] Fill soil material samples collected on subsurface layers in fill (4"-20"). Sample composited from ten sub-samples on each fill slope.

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TABLE II: SOILS PRODUCTIVITY ANALYSIS

Sample #	SAR	OM %	N %	Ca %	(Ca+Mg)	Mg %	Na (Meq/L)	K %	P ppm	$CaCO_3$ Equivalents %
1107	0.7	2.6			6.8		1.2	.01	1.9	
1108	0.7	3.9			3.9		1.0	.01	2.3	
1109	0.9	1.3			2.9		1.1	.006	.3	
1110	0.8	2.5			2.4		.9	.006	1.2	
1111	1.0	5.1			20.2		3.2	.02	2.6	
1117	0.8				23.3		2.7	.01	1.2	
1118	0.8				26.5		2.9	.01	.3	
1119	0.7				28.8		2.6	.01	.2	
DBD#1	3.03	13.88	.088	9.85		2.75	.076	.087	.125	17.9
DBD#2	3.28	9.24	.056	9.00		2.00	.077	.056	.064	16.5
DBD#3	2.76	15.29	.240	11.38		3.41	.075	.114	.059	16.9

INTERIM VEGETATION ESTABLISHMENT

FILL SLOPES

The fill slopes at the tipple area, bathhouse, coal stockpile area, Deseret pond and Beehive portal require interim stabilization. Revegetation of the fill slopes was implemented in 1981/82. However, adherence to specified methods and timing is questionable and monitoring was not conducted at the sites. Subsequent interim revegetation was completed in 1984 and 1988, at various locations at Des Bee Dove Mine, as discussed in the 1987 and 1988 Vegetation Monitoring Reports. The interim vegetation will control erosion by:

1. A vegetative cover to protect the soil surface.
2. A well developed root system to retard soil movement.

The interim vegetation plan will also provide the basis for developing a final revegetation plan by:

1. Testing various plant species adaptability to these soil materials. Introduced species also tested for their possible role in final revegetation.
2. Testing and developing planting techniques with the highest probability of success.
3. Developing some fill material as a substitute for topsoil by establishing a root system in the top layers along with organic material buildup and an environment suitable for micro-organism

colonization.

4. Provide a detailed analysis of soil productivity with a series of test over the life of the mine. This would be the basis for fertilization and soil handling at final revegetation.

The upper 18-24" fill layer will become the "topsoil" by nature of its established plant community with micro-organisms, organic deposition, nutrient soil cycles, root zone, etc. At final reclamation this "topsoil" will be removed and stored during the redistribution of fill and grading. Then the temporarily stored "topsoil" will be placed on the newly graded and prepared surfaces 6-12 inches deep at random locations. This will increase the variability of the soil surface.

The seed mix and plantings were designed more for soil stabilization than to provide wildlife food or livestock forage. The plant species were selected on the basis of their drought tolerance, alkalinity tolerance, vegetative growth form (cover soil surface), root systems and nitrogen fixing potential. Because the slope's aspects emulate the pinyon-juniper plant community on steep slopes most species selected were native to the reference area. Some faster growing species were utilized to provide plant cover while the slower native species become established.

The 1988 interim seed mixture was as follows:

COMMON NAME	SCIENTIFIC NAME	LBS/ACRE EQUIVALENT PLS*
Grasses		
Thickspike Wheatgrass	Agropyron dasystacyum var. Critana	5
Western Wheatgrass	Agropyron smithii var. Rosanna[1]	6
Salina Wildrye	Elymus salinus	1
Indian Ricegrass	Oryzopsis hymenoides var. Paloma	4
Squirreltail	Sitanion hystrix[2]	3
Greatbasin Wildrye	Elymus cinereus	3
Forbes		
Pacific Aster	Aster chilensis	0.2
Northern Sweetvetch	Hedysarum boreale	1
Yellow Sweetclover	Melilotus officinalis[2]	1
Alfalfa	Medicago savtiva var. Nomad[2]	1
Eaton Pentstemon	Penstemon eatonii[2]	1

PLS - Pure Live Seed
1 - Sod-forming variety
2 - Faster growing species

MECHANICS OF 1988 INTERIM REVEGETATION

FILL SLOPE

The fill slopes are relatively small areas and because of the steepness all of the seeding and planting work will be done by hand or by hydroseeding. These slopes are severe planting sites and successful establishment of a vegetation cover will require close attention to details, some favorable growing conditions and repeated efforts. The criteria for success will be the establishment of at least 60% ground cover on the majority of the slope. This may require a three to seven year period.

SEEDING (FALL 1988)

1. Slopes were cleaned of debris.
2. The seed mixture (Page 4-63) was applied.
3. The hydromulch/tackifier/fertilizer mixture was applied at the following rates:

Sylva fiber hydromulch	2000 lbs/acre
Organic tackifier	120 lbs/acre
Ammonium nitrate	50 lbs/acre
Triple superphosphate	75 lbs/acre

MAINTENANCE AND MONITORING

1. Signs will be placed around the planted slopes.
2. Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate or succession. Studies indicate that competition from weeds, including Salsola kali, is greatly reduced within three (3) years after revegetation. Preliminary on-site studies support published reports on this matter. All noxious weeds will be eradicated if they become established on the site.
3. Rodent damage, on revegetated areas, will be assessed and species-specific control measures will be implemented as necessary.
4. A site visit will be scheduled at least once each year to check on fitness of the sites and progress of the plant growth. Observations will be made to

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assess potential problems including; erosion, animal impacts, unusual conditions, (e.g. abnormal plant growth, areas of poor vegetation, etc.). Erosion will be repaired as needed.

5. Ground cover will be assessed by ocular estimation using meter square quadrants. Interim revegetation will be determined successful when erosion is effectively controlled or ground cover is a least 60%.

6. Annual report that summarizes the year's work will be placed in the Company's files and forwarded to DOGM and USFS.

7. The soil materials on the fill slopes will be sampled at five year intervals to record productivity changes. Five samples at 0-6", 6-12", and 12-18" depths will be composited for each of the five fill slopes for analysis. Analyses will be performed in accordance with Division Guidelines and will include:

    1. Soil Texture
    2. pH
    3. Electrical Conductivity
    4. Sodium Adsorption Ratio
    5. Organic Carbon/Organic Matter
    6. Saturation Percentage
    7. Available Water Capacity (1/3 and 15

atmosphere water)

8. Standard Ferility Test (for P and K analysis)

9. Field estimate of percent Rock Fragments (by volume)

Additional sampling will be conducted, as needed to delineate any problem areas identified during initial sampling.

INTERIM REVEGETATION (FUTURE)

When necessary to effectively control erosion on disturbed areas, seeding and planting will take place as contemporaneously as practicable with the completion of backfilling and grading. The following seed mixture and plantings will be applied at the specified rates. The species were recommended by the US Forest Service as being consistent with the management plan for the area. (Please refer to the Final Revegetation Plan for justification of introduced species.)

COMMON NAME	SCIENTIFIC NAME	LBS/ACRE EQUIVALENT PLS*
Grasses		
Thickspike Wheatgrass	Agropyron dasystacyum	2
Crested Wheatgrass	Agropyron cristatum	1
Western Wheatgrass	Agropyron smithii	3
Intermediate Wheatgrass	Agropyron intermedium	3
Smooth brome grass	Bromus inermis	2
Indian Ricegrass	Oryzopsis hymenoides	2
Needle-and-thread grass	Stipa comata	2

COMMON NAME	SCIENTIFIC NAME	LBS/ACRE EQUIVALENT PLS*
Forbes		
Pacific Aster	Aster chilensis var. adscendens	0.2
Utah vetch	Hedysarum boreale	1
Yellow Sweetclover	Melilotus officinalis	2

Alfalfa	Medicago savtiva var. Nomad	1.5
Eaton Pentstemon	Penstemon eatonii	0.4
	Total	20.1

*Application rates result in approximately 80 seeds/ft^2.

Shrubs

Serviceberry	Amelanchier alnifolia	100
Fourwing saltbush	Atriplex canescens	50
Snowberry	Symphoricarpos oreophilus	100
Winterfat	Ceratoides lanata	50

INTERIM REVEGETATION METHODS (FUTURE)

1. Seedbed Preparation

   Seeding will take place as contemporaneously as practicable following soil placement; therefore, the seedbed will be in a condition suitable for seed application. However, if a surface crust has developed it will be broken up by hand or mechanical tilling.

2. Seeding

   The seed mixture will be hand broadcast with "hurricane spreaders" or applied by hydroseeder at the specified rate.

3. Fertilizer Application

   The following fertilizer combination will be applied by hand broadcasting with "hurricane spreaders" or as a separate operation of hydroseeding:

Ammonium Nitrate	40 lbs/acre
Triple Superphosphate	35 lbs/acre

4. Seed Covering

   Following hand broadcasting of the seed mixture and fertilizer, the sites will be hand or mechanically raked to cover the seeds.

5. Mulch Application

   Following hand broadcasting and raking, the seeded areas will be covered with hay mulch (2 tons per acre) and netting or erosion control mulch blanket. The netting or blanket will be mechanically anchored per the manufacturers specifications.

   Following hydroseeding, a hydromulch with tackifier will be applied at the rate of approximately 2000 lbs/acre.

The criteria for interim revegetation success will be the establishment of at least 60% ground cover, on the majority of the slope, which prevents or minimizes erosion. Maintenance and monitoring will be conducted as described for 1988 interim seeding.

FINAL REVEGETATION PLAN

The fill material at the bathhouse fill will be the planting medium. Seeding will take place as contemporaneously with soil grading as is practicable in late fall. If considerable time (i.e. over one month) lapses between soil grading or seedbed preparation and seeding, the soil will be protected with a mulch cover, which will be mechanically or chemically anchored. A cover of hay mulch or hydromulch will be applied at a rate sufficient to provide 50 percent ground cover. The plantings will be randomly spaced and clumped for wildlife enhancement. Grazing will be enhanced by establishment of grasses. Grazing will not be allowed on the land until after bond release. Fencing will be installed if necessary to preclude grazing.

The final revegetation plan may be revised to incorporate the results of the interim revegetation and test plots. Shrub seeds may be included based on the success of shrub establishment from seed at existing reclaimed sites. Revisions will be approved by the Division prior to implementation.

TOPSOIL HANDLING

During backfilling and grading, all acid and toxic materials will be covered with at least four (4) feet of non-toxic material or disposed of in an approved disposal facility within the permitted area. When feasible, this will occur within 30 days after the material is first exposed. Temporary storage of the material, beyond 30 days must be approved by the Division. All toxic or acid-forming substances or chemicals used for mining operations will be removed or properly disposed of according to State and/or Federal regulations before reclamation commences.

Following the backfilling and grading, the surface of the backfilled material will be in an uncompacted rough condition. If areas develop where the surface is not in such condition, the material will be ripped and roughened using track-hoes, dozers and/or hand tools to eliminate slippage surfaces and promote root penetration.

Topsoil material will be redistributed on the regraded areas using backhoes, excavators and dozers.

Following redistribution the topsoil will be sampled (minimum of 2 samples/acre to 1' depth) and analyzed for fertility and other parameters listed within the Revegetation section (R614-301-353, Page 4-101).

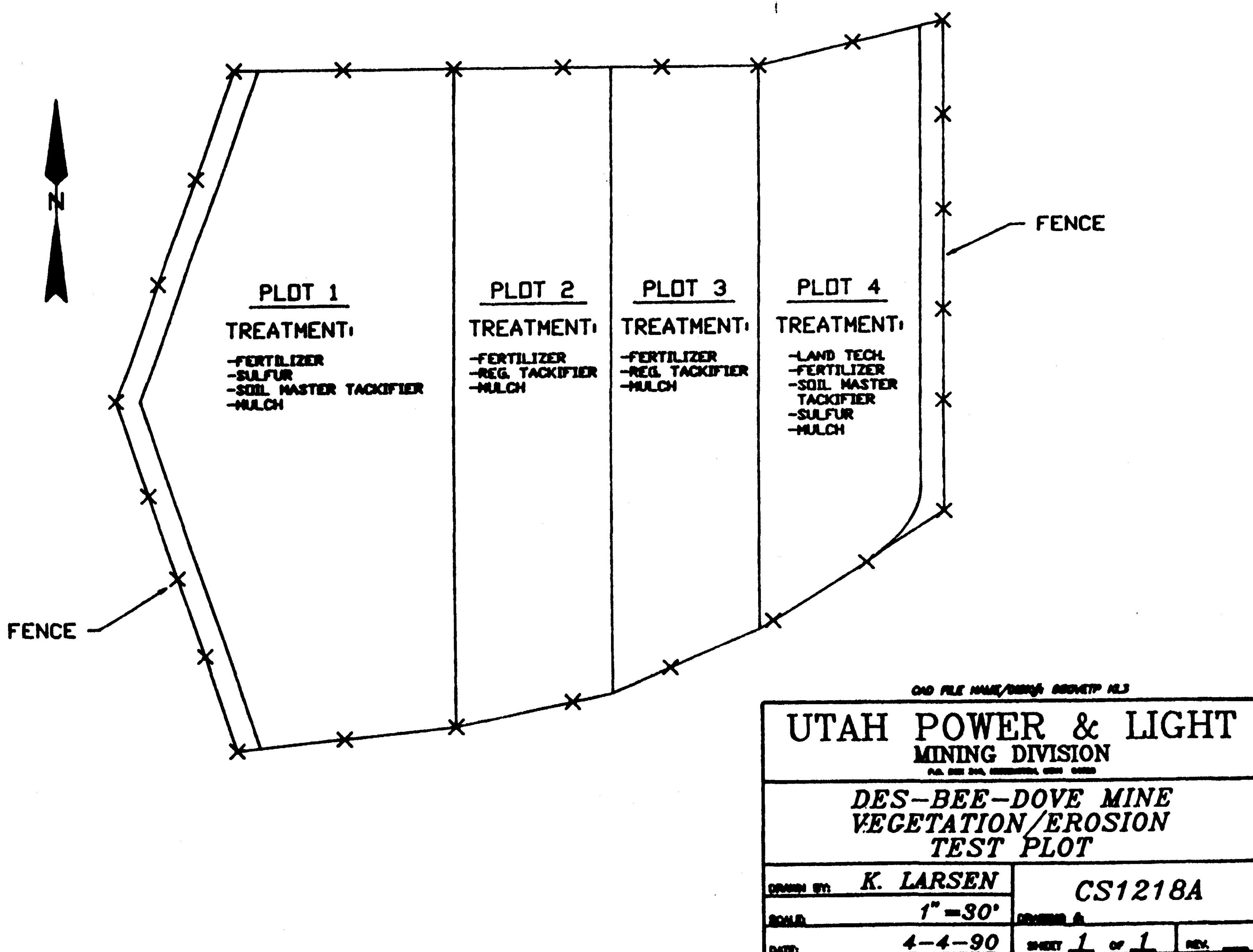
Because the majority of surface disturbance occurs on Forest Service land, the USFS has provided the Applicant with both interim and final revegetation seed mixes proposed for use. Plant species in both mixes are currently in use by the Manti-LaSal National Forest and commonly occur on the Wasatch Plateau. Both seed mixes will be evaluated in test plot field trials initiated in the fall of 1989 at the Cottonwood/Wilberg Mine. The elevation, soils, slopes, aspects and seed mixes at Cottonwood/Wilberg are similar to those at Des Bee Dove. Therefore, the test plots installed at Cottonwood/Wilberg will serve Des Bee Dove also.

Additionally, test plots were established at the Des Bee Dove Haul Road and Sediment Pond area to test various soil stabilizing, soil enhancing and mulch treatments. The plots were established in cooperation with Division personnel in October of 1989. The test plot layout is illustrated on page 4-72. The treatments include:

Land Tech Irish Peat Soil Enhancer (1 Ton, Plot 4)
Sulfur (250 lbs. each, Plot 1 & 4)
Soil Master Tackifier (25 gal. each, Plot 1 & 4)
Ammonium Nitrate (100 lbs. total site)
Triple Super Phosphate (150 lbs. total site)
Wood Fiber Mulch (440 lbs. total site)

The following seed mixture was applied over the entire site at the rates indicated.

SPECIES		PLS LBS/ACRE
Agropyron dasystachyum	thickspike wheatgrass	6
A. smithii	western wheatgrass	8
Oryzopsis hymenoides	Indian ricegrass	6
Elymus cinereus	basin wildrye	8
Sporobolus airoides	alkali sakatoon	.5
Melilotus officinalis	yellow sweetclover	4
Linum lewisii	Lewis flax	2
Sphaeralcea grossularifolia	globemallow	1
Atriplex canescens	fourwing saltbush	4
A. corrugata	mat saltbush	4
A. confertifolia	shadscale	2
Ceratoides lanata	winterfat	4
Kochia prostrata	prostrata kochia	1



N
FENCE
FENCE
PLOT 1
TREATMENT:
-FERTILIZER
-SULFUR
-SOIL MASTER TACKIFIER
-MULCH
PLOT 2
TREATMENT:
-FERTILIZER
-REG. TACKIFIER
-MULCH
PLOT 3
TREATMENT:
-FERTILIZER
-REG. TACKIFIER
-MULCH
PLOT 4
TREATMENT:
-LAND TECH.
-FERTILIZER
-SOIL MASTER TACKIFIER
-SULFUR
-MULCH
UTAH POWER & LIGHT
MINING DIVISION
DES-BEE-DOVE MINE
VEGETATION/EROSION
TEST PLOT
K. LARSEN
1" =30'
4-4-90
CS1218A
SHEET 1 OF 1

Because the mixes include six (6) introduced species, field trials will be conducted to demonstrate whether the introduced species can establish a diverse, effective and permanent cover capable of achieving the postmining land use.

The following information is provided for each of the introduced species as further justification for their use: Approval of introduced species in the Interim and Final Seed Mixtures were received through verbal conversation with US Department of Agriculture on 1-22-91 (Mr. Bob Thompson).

<u>Alfalfa and Yellow Sweetclover</u>

These species are included in the interim seed mixture and one or both of the final mixtures because of, (1) their nitrogen fixing ability; (2) deep tap roots; (3) highly rated forage quality; and (4) ability to encourage natural plant succession.

<u>Smooth Brome</u>

The following evidence suggest Smooth Brome is a deep rooting species that is ideally suited for inclusion in the interim seed mix. The maximum reported rooting depth for Smooth Brome given by Wyatt, et al (1980) was 76 cm. Nicholas (1979) reported of 17 grass species she evaluated, Smooth Brome had the highest overall root/shoot ratio (0.87). Dayton (1937) reported roots of Smooth Brome commonly penetrate to depths of five (5) feet or more. In addition to its deep rooting system, its sod-forming growth habits are ideally suited to control erosion. These characteristics justify its use for inclusion in the interim revegetation seed mixture.

Small Burnet

Small Burnet is included in the final seed mix for Pinyon/Juniper because of its ability to establish on disturbed sites and promote natural plant succession. According to Plummer, et al (1968), Small Burnet is a preferred plant for wildlife during late winter and early spring. Its relatively short persistence makes it an ideal nurse crop and successional species.

Intermediate Wheatgrass

The outstanding root growth characteristics of Intermediate Wheatgrass make this species ideal for interim and final revegetation in maintaining the viability of the soil biota. In a greenhouse study, Nicholas (1979) reported this species ranked fourth of seventeen species in overall root/shoot ration (.75) and second of the seventeen species in root biomass (40.15%). In another greenhouse study, McGinnies and Crofts (1986) found Intermediate Wheatgrass to have higher root/shoot ratios (1.29) in unfertilized treatment than Smooth Brome (0.49) or Slender Wheatgrass (0.19). McGinnies and Nicholas (1982) reported Intermediate Wheatgrass produced the highest root yields of seventeen species tested on raw soil.

Crested Wheatgrass

Crested Wheatgrass is valued as a long-lived, drought-resistant species which is easily established (SCS Bulletin TP-157, 1982). The species is equally valuable for its high productivity. Palatability is reported as excellent in the spring and late fall (SCS Plant Materials Guide, 1988). It's use is in the interium seed mixture.

REVEGETATION SCHEDULE

TASK	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Review revegetation plan	XX	X								
Order seed			X							
Order transplants						X				
Regrading					XXX	XXXX				
Seedbed preparation							XX	X		
Apply fertilizer								XX		
Seeding								XX	X	
Mulching								XX	X	
Tasks to be done in subsequent years:										
Plant seedlings[1]		XXX								
Monitor revegetation					XXXX	XXXX*		X**		
Submit monitoring report	X									

Timeframes are approximate and will vary depending on site conditions and the acreage involved.

[1] Plant transplants the spring following seeding if used.

* Monitor during peak of growing season as per monitoring schedule.
** For survival of transplants.

Final Seed Mixture - Mine Site Pinyon-Juniper Vegetation Type (20 Acres)

COMMON NAME	SCIENTIFIC NAME	PLS* LBS/ACRE
Grasses		
Western wheatgrass	Agropyron smithii	3
Intermediate wheatgrass	Agropyron intermedium	3
Bluebunch wheatgrass	Agropyron spicatum	3
Indian ricegrass	Oryzposis hymenoides	3
Needle and thread grass	Stipa comata	2
Thickspike wheatgrass	Agropyron dasystachyum	2
Forbs		
Blueleaf aster	Aster glaucodes	0.5
Utah sweet vetch	Hedysarum boreale	1
Small burnet	Sanguisorba minor	3
Lewis flax	Linum lewisii	1
Globemallow	Sphaeralcea coccinea	0.5
Yellow sweetclover	Melilotus officinalis	2
	Total	24

*Application rates result in approximately 80 seeds/ft^2.

Shrubs		
Serviceberry	Amelanchier alnifolia	400
Fourwing saltbush	Atriplex canescens	400
Green Mormon tea	Ephedra viridis	400
Big white rabbitbrush	Chrysothamnus nauseosus var. albicaulis	200
Trees		
Douglas fir	Pseudotsuga menziesii	120
Colorado blue spruce	Picea pungens	80
	Total	1600

Final Revegetation Methods

1. Seedbed Preparation

Seeding will take place as contemporaneously as practicable following soil placement; therefore, the seedbed will be in a condition suitable for seed application. However, if a surface crust has developed it will be broken up by hand or mechanical tilling.

2. Seeding

The seed mixture will be hand broadcast with "hurricane spreaders" or applied by hydroseeder at the specified rates. All seed will be inspected by a Utah Department of Agriculture inspector at the time of application.

3. Fertilizer Application

The fertilizer mixture will be applied by hand broadcasting with "hurricane spreaders" or as a separate operation of hydroseeding. Application rates will be determined from soil analysis of the "topsoil".

4. Seed Covering

Following hand broadcasting of the seed mixture and fertilizer, the site will be hand or mechanically raked to cover the seeds.

5. Mulch Application

Following hand broadcasting and raking, the seeded areas will be covered with hay mulch (2 tons per acre) and netting or erosion control mulch blanket. The netting or blanket will be mechanically anchored per the manufacturers specifications. Hay used for mulch will be inspected by a Utah Department of Agriculture inspector at the time of application. Following hydroseeding, a hydromulch with tackifier will be applied at the rate of approximately 2000 lbs/acre.

6. During the spring following seeding, containerized stock of the shrub and tree species will be planted by hand. Planting location will be mostly concentrated on northern exposures and/or deep within the canyon. At each planting site, a basin will be created to retain moisture. A fertilizer tablet will be placed near the root zone of each plant and each planting will be hand watered. The plants will be grouped in the following manner to achieve layering and optimize benefits to wildlife:

   a. Plant groups will be randomly located throughout the reclaimed site at the rate of two hundred (200) groups per acre. Site microclimate factors (i.e. moisture, exposure and aspect) will also be considered in selecting the location for plant groups.

   b. Plant group dimensions and plant spacings will vary. Layering will be as follows:

      Lower Layer = Ephedra viridis
      Atriplex canescens

Middle Layer = Amelanchier alnifolia
Chrysothamnus nauseosus

Upper Layer = Pseudotsuga menziesii
Picea pungens

c. Group composition:

Lower Layer = 4 shrubs

Middle Layer = 3 shrubs

Upper Layer = 1 tree

7. Irrigation application will be determined from test plot studies.

<u>Maintenance and Monitoring</u> (See Chart Page 4-87)

1. Signs will be placed around the planted slopes for their protection.

2. Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate or succession. Studies indicate that competition from weeds, including <u>Salsola kali</u>, is greatly reduced within three (3) years after revegetation. Preliminary on-site studies support published reports on this matter. All noxious weeds will be eradicated if they become established on the site.

3. Rodent damage on revegetated areas, will be assessed and species specific control measures will be implemented as necessary.

4. A site visit will be scheduled each spring to

check on fitness of the sites and check progress of the plant growth.

5. Annual monitoring will include inspection for rills and gullies. Should these be present, they will be filled and replanted.

6. Monitoring will be conducted in accordance with Division Guidelines.

7. Maintenance and monitoring activities will be reported in the Annual Vegetation Monitoring Report.

<u>Sampling for Ten Year Responsibility Period and Bond Release</u> (See Chart Page 4-87)

1. All sampling will be undertaken in the late summer for maximum plant growth.

2. The line intercept or ocular estimation methods will be used to measure cover and species composition.

3. The point-center quarter method will be used to measure shrub and tree density.

4. Sample size for ground cover and shrub density will be tested at a 90 percent confidence level using a one-tail "t" test with a 10 percent change in the mean.

5. Productivity measurements will be a double sampling procedure of clipped plots and ocular estimates. Rectangular plots (6.27" x 100") will

be randomly located in reference areas and revegetation sites. Sampling will be at the 90% confidence level.

6. The reference areas will be checked to detect any changes from man-induced activities and to verify they are in fair or better condition.

7. Revegetation Success:

   a. Sampling of reference sites at end of ten year responsibility period will be conducted concurrently with final reclamation sampling, using the same methodology. The range condition of all reference areas will be re-assessed every five years.

   b. Ground cover is established for two consecutive years at the end of responsibility period at 90 percent of reference site ground cover.

   c. At least 80% of the shrubs and trees will have been in place for a least 8 growing seasons, the tree or shrub is alive and healthy.

   d. The woody plants established on the revegetated site are equal to or greater than 90 percent of the stocking of live woody plants of the same life form of the approved reference areas with 90 percent statistical confidence.

e. Productivity will equal 90 percent of that of the reference areas at 90 percent statistical confidence.

f. A one-tail students "t" test of the sample means will be used for the statistical test.

g. At bond release a straightforward, understandable success standard will be used to determine the establishment of a diverse vegetative community. An example of one such method is: All species within each reference area are ranked by relative cover, productivity or frequency. The ranking determines the relative importance of each species. The number of species contributing greater than 5% of the relative cover in the reference area data designates the number of species, the life forms, and seasonality of the species to be present in the represented reclaimed areas. No one species would make up greater than 50% of the relative cover.

<u>Revegetation- Haul Road</u>:

Revegetation of the haul road will include application of soil amendments and stabilizing agents in addition to seeding and mulching. Seeding will take place as contemporaneously with soil grading as is practicable in late fall. If considerable time (i.e. over one month) lapses between soil grading and seeding, the soil will be protected with a mulch cover, which will be mechanically or chemically anchored. A cover of hay mulch or hydromulch will be applied at a rate sufficient to provide 50 percent ground cover.

The revegetation plan may be revised to incorporate results of the (Cottonwood/Wilberg and Des Bee Dove) test plot studies. Revisions will be approved by the Division prior to implementation.

<u>Seed Mixture</u> (Haul Road Pinyon-Juniper Vegetation Type)

Common Name	Scientific Name	lbs/acre
Grasses		
Thickspike Wheatgrass	Agropyron dasystachym	2
Streambank Wheatgrass	A. riparium	2
Basin Wildrye	Elymus cinereus	3

Galleta	Hilaria jamesii	1
Indian Ricegrass	Oryzopsis hymenoides	2
Sandberg Bluegrass	Poa sandbergii	0.5
Bottlebrush Squirreltail	Sitanion hystrix	1
Alkali Sacaton	Sporobolus airoides	0.25

Forbs

Prairie Aster	Aster tanacetifolius	0.5
Northern Sweetvetch	Hedysarum boreale	1
Yellow Sweetclover	Melilotus officinalis	3
Firecracker Penstemon	Penstemon eatonii	1
Scarlet Globemallow	Sphaeralcea coccinea	0.5
Alfalfa	Medicago sativa var. Ladak	1

Shrubs*

Black Sagebrush	Artemisia nova	1
Fourwing Saltbush	Atriplex canescens	5
Shadscale	A. confertifolia	3
Castle Valley Saltbush	A. cuneata	5
Low Rabbitbrush	Chrysothamnus viscidiflorus	1
Green Mormon Tea	Ephedra viridis	5
Mat Saltbush	Atriplex corrugata	5
Winterfat	Ceratoides lanata	2
Basin Big Sagebrush	Artemisia tridentata tridentata	0.25
	Total	43.0

* Minimum shrub stocking density will be 1400 shrubs per acre in accordance with reference area (See Page 2-168). Stocking success will be determined in accordance with R614-301-356.232.

Seed Mixture (Haul Road/Sediment Pond Salt-Desert Shrub Vegetation Type)

SPECIES		PLS lbs/acre
Agropyron dasystachyum	thickspike wheatgrass	3
A. smithii	western wheatgrass	4
Oryzopsis hymenoides	Indian ricegrass	3
Elymus cinereus	basin wildrye	4
Sporobolus airoides	alkali sakatoon	.25
Melilotus officinalis	yellow sweetclover	2
Linum lewisii	Lewis flax	1
Sphaeralcea grossularifolia	globemallow	.5
Atriplex canescens	fourwing saltbush	2
A. corrugata	mat saltbush	2
A. confertifolia	shadscale	1
Ceratoides lanata	winterfat	2
Kochia prostrata	prostrata kochia	.5
	TOTAL	25.25

Methods

1. Seedbed Preparation

   Seeding will take place as contemporaneously as practicable following soil placement; therefore, the seedbed will be in condition suitable for seed application. However, if a surface crust has developed it will be broken up by hand or mechanical tilling.

2. Soil Enhancer Application

   Two weeks prior to seeding a soil enhancer (i.e. Land Tech Irish Peat) will be applied with a hydroseeder at the rate of 250 lbs/acre or as recommended by the manufacturer.

3. Seeding

   The seed mixture will be applied by hydroseeder at the specified rates. All seed will be inspected by a Utah Department of Agriculture inspector at the time of application.

4. Fertilizer/Amendment Application

   The fertilizer and sulfur mixture will be applied by hydroseeder at the following rates:

   Ammonium Nitrate - 200 lbs/acre
   Triple Super Phosphate - 300 lbs/acre
   Sulfur - 1000 lbs/acre

5. Mulch/Tackifier Application

   A wood fiber hydromulch with "Soil Master" (or equal) tackifier will be applied at the following rates (or as recommended by the manufacturer):

   Tackifier - 50 gal/acre
   Hydromulch - 2000 lbs/acre

Maintenance and Monitoring (See Chart Page 4-87)

1. Signs will be placed at the planted areas for their protection.

2. Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate of succession. All noxious weeds

will be eradicated if they become established on the site.

3. Rodent damage on revegetated areas, will be assessed and species specific control measures will be implemented as necessary.

4. A site visit will be scheduled each spring to check on fitness of the sites and check progress of the plant growth.

5. Annual monitoring will include inspection for rills and gullies. Should these be present, they will be filled and replanted.

6. Monitoring will be conducted in accordance with Division Guidelines as indicated on page 4-4.53.

7. Maintenance and monitoring activities will be reported in the Annual Vegetation Monitoring Report.

Sampling for Ten Year Responsibility Period and Bond Release (See Chart Page 4-87)

1. All sampling will be undertaken in the late summer for maximum plant growth.

2. The line intercept or ocular estimation methods will be used to measure cover and species composition.

3. The point-center quarter method will be used to measure shrub and tree density.

4. Sample size for ground cover and shrub density will be tested at a 90 percent confidence level using a one-tail "t" test with a 10 percent change in the mean.

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

6. The reference areas will be checked to detect any changes from man-induced activities and to verify they are in fair or better condition.

7. Revegetation Success:

a. Sampling of reference sites at end of ten year responsibility period will be conducted concurrently with final reclamation sampling, using the same methodology. The range condition of all reference areas will be re-assessed at five year intervals.

b. Ground cover is established for two consecutive years at the end of responsibility period at 90 percent of reference site ground cover.

c. At least 80% of the shrubs and trees will have been in place for at least 8 growing seasons, the tree or shrub is alive and healthy.

d. The woody plants established on the revegetated site are equal to or greater than 90 percent of the stocking of live woody plants of the same life form of the approved reference areas with 90 percent statistical confidence.

e. Productivity will equal 90 percent of that of the reference areas at 90 percent statistical confidence.

f. A one-tail students "t" test of the sample means will be used for the statistical test.

DES-BEE-DOVE MINE

FINAL RECLAMATION MONITORING

TEN YEAR RESPONSIBILITY PERIOD	1st YEAR	2nd YEAR	3rd YEAR	4th YEAR	5th YEAR	6th YEAR	7th YEAR	8th YEAR	9th YEAR	10th YEAR
QUALITATIVE OBSERVATIONS										
SPRING SITE VISIT		■	■	■	■	■	■	■	■	■
FALL SITE VISIT		■	■	■	■	■	■	■	■	■
QUANTITATIVE OBSERVATIONS										
COVER		■	■		■				■	■
FREQUENCY		■	■		■				■	■
WOODY PLANT DENSITY		■	■		■				■	■
PRODUCTIVITY									■	■

SEDIMENT POND

Approximately five years after initial seeding and planting has taken place and revegetation success has reached the 90% statistical confidence level the sediment pond will no longer be needed. Therefore, it is planned to remove this facility by first, decanting the pond and allowing it to dry out, second, remove all piping, culverts and valves, and third, remove the dam using this material for backfill. The pond area will then be covered and graded utilizing stockpiled material (12,650 cyds) stored on site during pond construction (see Map 2-16). The stockpiled material will be placed over the regraded disturbed area (4.5 acres) at a depth of 18 inches. Revegetation will utilize the same Salt-Desert Shrub seed mixture, seeding and planting techniques and methodologies outlined for the haul road. Maintenance and monitoring along with sampling for ten year responsibility will also utilize methods and chart outlined for the haul road. (See Pages 4-82 thru 4-87)

Final reclamation in this area is intended to reestablish the original drainage channels that existed prior to pond and road construction. All grading and recontouring as shown on Map 4-1 (sheet 3 of 5) exemplifies the final topography configuration.

The sediment burial area located 150 feet northwest of the pond will not be affected during final reclamation of the pond. This sediment burial will have already been stabilized and revegetated prior to final reclamation activities.

SEDIMENTATION CONTROL

Sediment control is provided in several ways. First, utilizing a series of small contour ditches spaced approximately 15 feet apart, each ditch will contain approximately one cubic foot of water per lineal foot of ditch. This provides not only water retention to lessen runoff and reduced sediment loading but enhances soil moisture for plants adjacent to the ditches. Second, the entire revegetated area is covered with a mulch, tackifier and soil enhancer. All ditches will be constructed on level contours as close as possible to prevent flow down the furrows. As a measure of erosion control, small earthen check dams will be implemented at 20 to 30 foot intervals (as required by DOGM). Each contour ditch will be blocked off at both ends to allow water retention within the area of each ditch to encourage revegetation success.

This system of sediment control will provide positive restraints in controlling runoff and erosion during the initial revegetation period.

EAST MOUNTAIN ACCESS

The main road which serves the mine is also an access road for local cattlemen who, twice each year, herd cattle through the mine area to reach East Mountain.

As this road is an established cattle drive route and the only road to East Mountain on the east side, it is desirous to maintain this road independently from the mine's final reclamation plan.

All other roads to be reclaimed in the permit area will be scarified prior to topsoil placement.

PLAN FOR GRADING ALONG THE CONTOUR

All final grading, preparation of overburden before replacement of topsoil, and placement of topsoil, shall be done along the contour to minimize subsequent erosion and instability. If such grading, preparation, or placement along the contour is hazardous to equipment operators, then grading, preparation, or placement in a direction other than generally parallel to the contour may be used. In all cases, grading, preparation, or placement shall be conducted in a manner which minimizes erosion and provides a surface for replacement of topsoil which will minimize slippage.

TOXIC OR ACID FORMING MATERIAL

All concrete above ground, all asphalt and all coal cleaned up from surface areas are to be buried on the bathhouse-warehouse pad with four feet of non-toxic material.

Any other material found to be toxic or acid forming will be disposed of at an approved disposal facility within the permitted area. When feasible, this will be accomplished within 30 days after the material is first exposed. Temporary storage of the material, beyond 30 days must be approved by the Division.

STABILITY

Final reclaimed slopes will be built at 2H:1V or less. Material used for the backfill will be less than 3' diameter. The material will be selectively placed in 18" lifts and compacted.

No ground water is located in any of the backfilled areas, therefore, no pore water pressure is used in the analysis.

Slope stability analysis was calculated on the bathhouse fill. The soil parameters used by Rollins, Brown and Gunnel were used because the material is the same.

C= 400 pcf

ϕ = 32°

γ = 80 psf

H = 184

Slope = 2H:1V

Calculated Safety Factor SF = 1.74

All other reclaimed slopes are less in height and have the same strength parameters, therefore, the safety factor is the same or greater.

The one exception is the tipple yard fill which is not changed for final reclamation, therefore, existing and final stability are the same. This is discussed in the Operation Plan under <u>Existing Structures - Stability Analysis</u>.

<u>FINAL RECLAMATION</u>

<u>HYDROLOGICAL BALANCE</u>

Upon final reclamation a permanent diversion drainage channel will be constructed through the mining area. The channel will accommodate the runoff and peak flows from a 100 year storm event. Assumptions, calculations and methodology can be found in Appendix XII. Routing of the drainage channel is depicted on the final reclamation Map 4-1.

It is the intention of Applicant to place the drainage channel, for the most part, in its original configuration with the exception of the fill Structure #1.

The access road and drainage channel are parallel along the fill. Their location is such as to take advantage of parent material adjacent to a realigned road bed. When the channel crosses the fill structure a clay filter layer will be required in addition to the regular gravel filter and rip-rap layers.

Hydrologic and rip-rap design calculations are listed in the following tables.

Construction and design of rip-rap cascading dissipation fan structure is shown on the final reclamation map also, with a fording to allow a permanent crossing.

Cross-sectional and plan views of the road ford as well as design details are shown on the Des Bee Dove Final Reclamation Map. Flow velocity vector analysis shows a maximum change in water surface elevation at the bend of 0.3 feet. With an adjusted total depth of 1.6 feet there is a designed freeboard of 1.9 feet.

Presently, design procedures aren't available to facilitate rip-rap design for slopes greater than 50%, yet slopes at the lower end of the Des Bee Dove Mine pad range from 60 to 70%.

The following is the combined results of a meeting held between the Company, OSM and the DOGM concerning acceptable practices for channelization and energy dissipation.

1. The stream channel would be conveyed as far as possible downstream of the mine pad fill before entering the cascading rock fan. This would help eliminate direct erosive contact of the water with the fill material.
2. Large diameter rip-rap would be placed down the slope to act as a cascading energy dissipator. A D_{50} rip-rap size of 3 feet will be used down the slope.
3. An energy dissipating pool of water would be built at the bottom to return the water to the natural channel.

The general conclusions discussed above reflect a practical solution to a difficult problem. Design details and parameters for the channel, fan and energy dissipator are shown on the Final Reclamation map.

The channel inlet at the upper end of the mine pad is not meant to be an energy dissipator, although some head loss will be encountered. Backwater analysis showed that a smooth constricting transition will convey the upstream supercritical flows smoothly into the normal water depth for the downstream section. Transition location, design details, and rip-rap requirements are shown on the Des Bee Dove Final Reclamation Map and Cross-Section Profile Map 4-3. The stream calculations for sections above and below the transition are shown below. The difference in normal flow velocity head between the two sections equals 4.8 feet.

	Natural Channel Above Transition	Riprapped Channel Below Transition
Bottom Slope (ft/ft)	.37	.04
Bottom Width (ft)	20	15
Side slope (M:1)	2	2
Manning's n	.035	.04
Flow Depth (ft)	0.8	1.8
Area (ft^2)	16.3	33.1
Perimeter (ft)	23.4	23.0
Hydraulic Radius (ft)	0.7	1.4
Mean Velocity (fps)	20.3	10.1
Froude Number	4.3	1.5
Rip-rap D_{50}	-	1.0
Rip-rap Thickness (ft)	-	2.0

DESIGN CALCULATIONS FOR THE DES-BEE-DOVE MINE

VAUGHN HANSEN ASSOCIATES
CONSULTANTS / ENGINEERS

COMPUTED DEH CLIENT UPL PERMIT
CHECKED PROJECT DES-BEE-DOVE
DATE FEATURE DESIGN CALC'S

CHANNEL DESIGN

Q = 332 cfs

H:V	Deg.
2:1	26.6
2.5:1	21.8
3:1	18.4

D_{50}	Mannings η
.25-.5	.031-.035
.75-1.0	.038-.040
1.25-1.5	.041-.042
1.75-2.0	.043-.044
2.5-3.0	.046-.047

STATION FROM	TO	SLOPE S_f (ft/ft)	BOTTOM WIDTH B (ft)	SIDE SLOPE H:V	MANNINGS η	FLOW DEPTH Y_o (ft)	AREA $(ft)^2$	PERIMETER (ft)	HYDRAULIC RADIUS (ft)	MEAN VELOCITY V_o (fps)	FROUDE NUMBER F_r	RIPRAP D_{50} (ft)	D_{max} (ft)	RIPRAP THICKNESS (ft)
0+00	3+50	.044	15	2:1	.040	1.8	33.3	23.0	1.4	10.0	1.4	1.0	1.8	2.0
3+50	8+40	.051	15	2:1	.041	1.7	32.2	22.8	1.4	10.3	1.6	1.25	2.0	2.5
8+40	10+00	.219	20	2:1	.044	1.0	22.4	24.5	0.9	14.9	2.7	20	—	2.5

(riprap design for x = 8+40 to 10+00 is based on the Surface Mining Water Diversion Design Manual with Hydraulics calculated using the Mannings equation.)

DITCH A
Q_{100} = 24cfs

FROM	TO	SLOPE	B	H:V	η	Y_o	AREA	PERIMETER	HYD. RADIUS	V_o	F_r	D_{50}	D_{max}	THICKNESS
0+00	1+00	.12	2	2:1	.042	0.8	3.0	5.7	0.5	8.0	1.6	1.5	1.0	2.0
1+00	2+00	.08	2	2:1	.040	0.9	3.4	6.0	0.6	7.2	1.3	1.0	1.0	2.0
2+00	3+00	.10	2	2:1	.041	0.9	3.1	5.8	0.5	7.6	1.5	1.25	1.0	1.75
3+00	5+00	.15	2	2:1	.042	0.8	2.8	5.5	0.5	8.7	1.7	1.5	0.8	2.0
5+00	6+00	.10	2	2:1	.041	0.9	3.1	5.8	0.5	7.6	1.5	1.25	1.0	1.75
6+00	10+75	.02	2	2:1	.035	1.2	5.1	7.2	0.7	4.7	0.8	—	—	—

DITCH B
Q_{100} = 15cfs

		SLOPE	B	H:V	η	Y_o	AREA	PERIMETER	HYD. RADIUS	V_o	F_r	D_{50}	D_{max}	THICKNESS
		.077	2	2:1	.038	0.7	2.3	5.1	0.5	6.4	1.4	0.75	0.8	1.5

VAUGHN HANSEN ASSOCIATES
CONSULTANTS / ENGINEERS

COMPUTED DEH — CLIENT UPL Permit
CHECKED ____ — PROJECT Des Bee Dove
DATE 11 Nov 83 — FEATURE ____

Riprap freeboard requirements (Sharp Bend Procedure - Design of Stable Channels with Flexible Linings: Hyd. Circular No 15 - OCT 75, Fed Highway Adm)

$Y_{design} = 1.3$ ft (flow depth)

$V = 14.9$ fps
$R_d = 200'$

$\frac{V^2}{R_d} = 0.79$

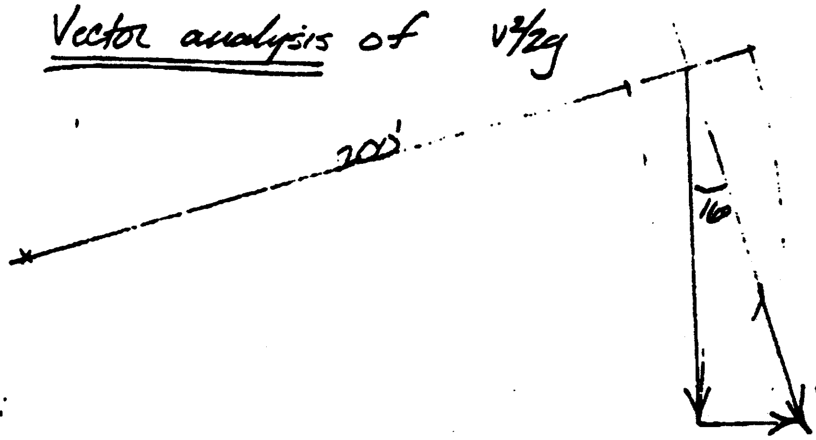
$K_3 = 3.37$ $\quad d_{adj} = 3.37 * 1.3 = 4.4'$

$K_3 = 3.37$ $\quad \Delta_c = 25°$ $\quad \Delta = 38$

$K_3' = 1 + [(3.37 - 1)\frac{38}{25}] = 4.6$

$d_{adj} = 4.6 * 1.3 = 6.0$ ft - USE FOR SIZING RIPRAP - Use grouted riprap and smaller riprap D_{50}.

<u>Vector analysis of $V^2/2g$</u>



$15 \sin 16° = V_y$

$V_y = 4.1$ ft/s
$V_x = 14.4$

NOTES:

- K_3 taken from Circular 15 - Chart 33
- $d_{adj} = K_3'(d)_{straight}$
  = depth of flow for riprap sizing. Riprap to be grouted.

Velocity head required to change direction of flow (with $r = 200'$) is equal to:

$V_y = V \sin\alpha \qquad \alpha = 16°$
$= 4.1$ fps

Velocity Head $= \frac{V^2}{2g} = \frac{V_y^2}{2g} = \frac{(4.1\text{ fps})^2}{2(32.2)} = 0.26' \Rightarrow$ <u>0.3 ft</u>

VELOCITY VECTOR ANALYSIS
FINAL RECLAMATION CHANNEL

BACK WATER ANALYSIS
FINAL RECLAMATION CHANNEL

DES-BEE-DOVE UPPER TRANSITION

UPPER	TO TRANSITION	TO		LOWER	
	N	S	M	B	L
UPPER	0.035	0.370	2.0	22.0	0.0
TRANS	0.040	0.045			35.0
LOWER	0.040	0.045	2.0	15.0	10.0

Q= 332.00

INDEP. VAR., X	DEP. VAR., Y	DERIVATIVE DY/DX	INCREMENT DLX	FR2
+0.000	0.70	+3.209888E-02	+0.500	19.317
+0.500	0.72	+3.201055E-02	+0.500	18.179
+1.000	0.73	+3.192696E-02	+0.500	17.139
+1.500	0.75	+3.184769E-02	+0.500	16.185
+4.000	0.83	+3.150668E-02	+1.000	12.420
+6.000	0.89	+3.128688E-02	+1.000	10.277
+8.000	0.95	+3.110275E-02	+2.000	8.648
+10.000	1.01	+3.094678E-02	+2.000	7.381
+12.000	1.08	+3.081362E-02	+2.000	6.380
+16.000	1.20	+3.060192E-02	+4.000	4.921
+20.000	1.32	+3.045178E-02	+4.000	3.931
+24.000	1.44	+3.036311E-02	+4.000	3.232
+32.000	1.69	+3.043907E-02	+8.000	2.339
+32.000	1.69	+3.043907E-02	+4.000	2.339
+36.000	1.79	-2.560583E-03	+4.000	1.997
+40.000	1.79	-1.494595E-04	+4.000	2.101
+44.000	1.78	-7.612730E-04	+4.000	2.073
+32.000	1.69	+3.043907E-02	+2.000	2.339
+34.000	1.75	+3.053690E-02	+2.000	2.182
+36.000	1.78	+2.458351E-03	+2.000	2.240
+38.000	1.78	-3.878600E-04	+2.000	2.090
+32.000	1.69	+3.043907E-02	+1.000	2.339
+33.000	1.72	+3.048279E-02	+1.000	2.258
+34.000	1.75	+3.053658E-02	+1.000	2.182
+35.000	1.78	+3.060160E-02	+1.000	2.111
+35.000	1.78	+3.060144E-02	+0.500	2.111
+35.500	1.78	-1.244645E-03	+0.500	2.051
+36.000	1.78	-4.103013E-05	+0.500	2.106
+36.500	1.78	-8.155685E-05	+0.500	2.104
+35.000	1.78	+3.060144E-02	+0.250	2.111
+35.250	1.78	-5.737561E-04	+0.250	2.081
+35.500	1.78	-7.679084E-06	+0.250	2.108
+35.750	1.78	-1.745344E-05	+0.250	2.108
+35.000	1.78	+3.060144E-02	+0.125	2.111
+35.125	1.78	-2.536975E-04	+0.125	2.096
+35.250	1.78	+2.085291E-05	+0.125	2.109
+35.375	1.78	+1.825592E-05	+0.125	2.109

Watershed Subarea	Area (acres)	Average Slope (%)	Curve Number	Hydraulic Length (ft)	2-YR Runoff (cfs)	10-YR Runoff (cfs)	100-YR Runoff (cfs)
IIIA	170	63.5	85	4,000	-	136	332
IIIB	11.7	166	85	2,330	-	-	24
IIIC	6.9	31.6	87	980	-	-	15

AREA= 170.0 ACRES
AVERAGE BASIN SLOPE= 63.5 PERCENT
INCREMENT OF RAINFALL EXCESS= .0230 HOURS
CURVE NUMBER= 85.
DESIGN STORM= 2.00 INCHES
STORM DURATION= 24.0 HOURS
HYDRAULIC LENGTH= 4000. FEET

TP= .1139 HOURS QPCFS= 1129.00 CFS QPIN= 6.5861 INCHES C3= 32.462
ITERATIONS= 8

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
11.89	1.1602	.2534	.0183	.0	115.12
11.91	1.1952	.2721	.0187	.0	119.37
11.94	1.2301	.2912	.0192	.0	123.43
11.96	1.2651	.3108	.0196	.0	127.31
11.98	1.3000	.3308	.0200	.0	131.02
12.01	1.3277	.3468	.0161	.0	134.33
12.03	1.3343	.3507	.0039	.0	135.48
12.05	1.3410	.3546	.0039	.0	130.99
12.07	1.3476	.3585	.0039	.0	119.98
12.10	1.3542	.3624	.0039	.0	104.68
12.12	1.3608	.3664	.0039	.0	88.19
12.14	1.3674	.3703	.0039	.0	72.95
12.17	1.3741	.3743	.0040	.0	60.27

HYDROGRAPH PEAK= 135.73 cfs
TIME TO PEAK= 12.02 Hours

Soil Sampling

After mining and prior to reclamation, a soil sampling program will be implemented to; (1) determine the extent of suitable substitute topsoil material, and (2) identify acid and toxic-forming materials. Samples will be taken as follows:

Location	Sample Sites	*Map Loc. #'s	Samples/ Site	Sample Depth
Haul Road	4	SS1	6	0-2'
		SS2	3	0-1' 1'-2'
		SS3	3	0-2' 2'-5'
		SS4	3	0-2' 2'-5'
Tipple Yard	1	SS5	3	0"-6" 6"-2' 2'-5'
Bathhouse Slope	1	SS6	5	0-2' 2'-5'
#1 Stockpile Area	4	SS7	3	0-6" 6"-2' 2'-5' 5' intervals to depth of removal.
		SS8	2	0-2'
		SS9	2	0-2'
		SS10	3	0-2'
Beehive-Little Dove Pad	1	SS11	7	0-2' 2'-5'

(Refer to Map 2-15, Drawing No. CM-10336-DS Revised 7/11/88 and Map 5-6, Drawing No. CM-10613-DS, Revised 7/11/88 for proposed sample locations.)

*Map location indicates vicinity of sample location sites (i.e. SS1 indicates six separate sample locations).

Each soil sample will be analyzed for the following (according to DOGM Guidelines):

Texture (% sand, silt, clay)

SAR (meq/l)

pH (standard units)

Ec (mmhos/cm)

Saturation Percentage (%)

Organic Carbon (%)

Total N (%)

Available Phosphorus (mg/Kg)

Boron (mg/Kg)

Selenium (mg/Kg)

Acid-Base Potential

The analysis data will be evaluated and the location and quantities of suitable substitute topsoil materials will be determined. If analysis data indicate the presence of acid or toxic-forming materials, sufficient additional sampling will be conducted to delineate the extent of such materials. All acid or toxic-forming materials will be covered with four (4) feet of non-toxic material.

Coal material in all pads will be analyzed for toxic or acid-forming characteristics. If found to be toxic or acid-forming, the material will be removed to an approved disposal site within the permitted area or buried on-site with a minimum of four (4) feet of non-toxic material. When feasible, this will be accomplished within 30 days after the material is first exposed. Temporary storage of the material, beyond 30 days must be approved by the Division. If identified areas of toxic and acid-forming materials are large enough in volume that adequate cover material is reduced, suitable material will be purchased from an outside source. All toxic or acid-forming substances or chemicals used for mining operations will be removed or properly disposed of according to State and/or Federal regulations before reclamation commences.

RECLAMATION COST (R614-301-334)

Estimated costs for reclamation are based on 1990 values and include all lands having been disturbed for the purpose of handling, crushing, storing and transporting coal extracted through the Deseret, Beehive and Little Dove Mines.

The following are the estimated costs for reclamation. (See Pages 4-109 thru 4-115.)

1.	Surface facilities removal Items 1 and 2	$ 197,935
2.	Backfilling, compacting, grading Items 3 through 6	506,376
3.	Revegetation Items 7 through 13	380,984
*4.	Mobilization and demobilization	10,000
5.	10% Contingency	114,047
	1990 Total Reclamation Cost	$1,209,342

*It is customary for contractors, who must move men and equipment from job site to job site, to charge additional monies to competitively bid for such purpose. This charge is usually in the form of mobilization and demobilization. On very large projects these charges are usually built into the unit costs of work. Applicant states no costs are built into the reclamation work and will provide a lump sum of $10,000 for such purpose. It is felt this sum is sufficient to transport the needed equipment from any of the three major cities along the Wasatch Front.

The average cost increase, during the preceding three years, as provided by the Means Historical Cost/Index (Salt Lake Index) is 1.84%.

Using the 1990 reclamation costs of $1,254,519 this compounds to $1,374,261 for 1995 reclamation costs.

The performance bond will be conditional upon the faithful performance of the requirements of the act, the regulatory program and the reclamation plan.

RECLAMATION PLAN: PROTECTION OF THE HYDROLOGIC BALANCE (R614-301-723)

Because the Des Bee Dove Mine workings are dry, no special provisions will have to be made to insure that water wouldn't flow from the mine portal after the mine is abandoned. The portals, however, will be sealed with a double-block wall 25 feet in from the surface. The area between the block wall and the surface will then be back-filled. This, along with the fact that the mine is dry, will insure that no water will flow from the portal after the mine is abandoned. Representatives of the BLM will be notified when the portal sealing will begin. Recommendations made by the BLM will be followed when sealing these portals.

The Des Bee Dove Mine complex is located in a small, dry wash. Water in limited quantities flows down the wash only during storms. These waters are all diverted into a sediment pond. The size of the pond is adequate to retain water from a storm exceeding 1.5 inches in a 24 hour period. Accumulated sediment will be dredged from the sediment pond as required to retain the pond's water holding capacity. This sediment will be disposed of in the waste rock disposal site. When water is discharged from the sediment pond into the drainage, it will be monitored to insure that the effluent limitations aren't exceeded, refer to Hydrologic Section for a copy of UPDES permit.

The land surface above the Des Bee Dove Mine workings is generally dry. One spring (82-51) is present above the existing or proposed mine workings (refer to the Hydrologic Section of the permit for the location, sampling frequency and monitoring parameters). Monitoring of that spring has shown no mining induced changes. It is felt highly unlikely that mining will have any effect on the hydrologic regime of the area.

The Des-Bee-Dove, Cottonwood/Wilberg junction road, sediment pond and sediment structure are located in an area that is free from groundwater or surface water. The impermeable strata of the Masuk Shale acts as an aquiclude to any water which migrates down through the overlying strata. Because of this, the strata in the area of the road is dry. The surface water that is periodically present occurs as runoff from rains generally from summer thunder storms. This runoff intersects several minor washes which have been culverted beneath the road to adequately handle the storm events. Therefore, it is not felt that this road will impact the hydrologic balance of the area. The road, sediment pond and sediment disposal area are of such a minor nature that no action is required to mitigate their impact to the hydrologic regime.

HYDROLOGIC BALANCE: WATER QUALITY STANDARDS AND EFFLUENT LIMITATIONS

Throughout the life of the mine and following its reclamation after mining is completed, measure will be taken to insure that the surface water which flows through and adjacent to the mine area meets the effluent limitation set forth in R614-301-751 of the Utah Mining Code.

RECLAMATION PLAN: POSTMINING USES (R614-301-412.100)

The disturbed area (portal area of the Des Bee Dove Mines) lies within a small, steep, dry wash. Reclamation work identified within this wash states that disturbances shall be placed back to approximate original contours. Regraded and compacted fills of the three small structures requiring reclamation in the wash after revegetation should provide equivalent cover and grazing that existed prior to mining.

Reclamation of the bathhouse structure incorporating terraces provides level area where revegetated cover would be increased as compared to the premining steep slopes. The tipple pad structure with an area of 4 acres is additional land now usable which, before mining, was eroded, steep cliffs, for the most part, void of vegetation. These features provide enhanced wildlife habitat.

A key element of the reclamation plan as envisioned, is the reclamation of the road system to a cattle trail to allow continued use of the area by the present users i.e., cattlemen, sportsmen and property owners.

The cattle trail established in the reclaimed road area (see Final Reclamation map) will discourage casual users from proceeding further than the mine area. Cattlemen who need East Mountain access can use the cattle trail.

Land use after reclamation primarily would be the same as before mining, that is, grazing and wildlife habitat.

Alternate land uses besides grazing and wildlife habitat would include recreation, such as hunting. The absence of water limits the potential of other uses.

The extended period of responsibility will continue for not less than 10 years. The applicant feels that in the ten years following mining (bond period), there is sufficient time to manage the vegetational establishment and growth to meet and achieve the requirements of the postmine land uses as set forth within Applicant's reclamation plan found herein.

The areas which are disturbed and are proposed for reclamation are either owned by the Applicant or the Applicant has obtained a right-of-way to utilize the surface from others. Where the Applicant is the legal surface owner, the proposed land use is stated herein. The other legal/equitable surface owners include the United States Forest Service, Bureau of Land Management and the State of Utah Division of Lands and Forestry. Each right-of-way obtained from these surface owners stipulates that upon abandonment that each site will be restored to their natural state insofar as practicable and subject to their satisfaction. Applicant states that proposed land use found herein is synonymous with the other legal/equitable surface owners.

The county road which provides access to the mine site and traverses over forest land will be reclaimed leaving a cattle trail. This road is an established access to East Mountain for cattle grazing purposes. The cattle trail is comprised of natural rubble material and revegetation is impractical.

PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES (R614-301-411.142)

No public parks are located in or adjacent to the permit area.

Cultural resource information contained in this application was based on field surveys contracted to A.E.R.C. (Archeological-Environmental Research Corporation) and conducted under the auspices of Richard Hauck.

For lands within the permit area not covered by planned surface disturbances, but which could be affected by subsidence, a general 15 percent random survey was conducted. Basis of this survey was extrapolated from requirements mandated by OSM for authorization to mine coal from the Des Bee Dove Mine. Results of this survey are contained in the report found in the Environment Section.

<u>RELOCATION OF PUBLIC ROADS</u> (R614-301-521.133)

The Des Bee Dove Mine portal requires no further action for public review concerning mining within 100 feet of public road.

DESERET-BEEHIVE-LITTLE DOVE MINES
RECLAMATION COSTS
SURFACE FACILITIES REMOVAL

ITEM #	DESCRIPTION	EQUIPMENT MANPOWER	QUANTITIES	TOTAL COST	CONSTR. DAYS	COMMENTS
1-A	Office-Bathhouse Warehouse Building	Crane Flatbed Truck 5-Man Crew	1 lot	$ 15,603	8 Days	Structure is sheet metal over steel frame.
1-B	Tipple Building	Crane Flatbed Truck 5-Man Crew	1 lot	46,808	24 Days	
1-C	Conveyor System and Stacking Tube	Crane Flatbed Truck 5-Man Crew	1,000 ft.	19,503	10 Days	Overhead and underground.
1-D	Deseret Fan #1	Crane Flatbed Truck 5-Man Crew	1 lot	3,901	2 Days	
1-E	Deseret Fan #2	Crane Flatbed Truck 5-Man Crew	1 lot	3,901	2 Days	
1-F	Beehive Fan	Crane Flatbed Truck 5-Man Crew	1 lot	3,901	2 Days	
1-G	Little Dove Fan	Crane Flatbed Truck 5-Man Crew	1 lot	3,901	2 Days	
1-H	Culinary Water Tank	Crane Flatbed Truck 5-Man Crew	1 lot	1,950	1 Day	
1-I	Material Storage Shed	Crane Flatbed Truck 5-Man Crew	1 lot	3,901	2 Days	

ITEM #	DESCRIPTION	EQUIPMENT MANPOWER	QUANTITIES	TOTAL COST	CONSTR. DAYS	COMMENTS
1-J	Water System Water Tank, Pump House and Water Line	Crane Flatbed Truck 5-Man Crew	1 lot	$ 3,901	2 Days	
1-K	Underground Shop	988B Flatbed Truck 5-Man Crew	1 lot	4,460	2 Days	Tear down portal and bury.
1-L	Fuel and Oil Storage Tanks	Crane Flatbed Truck 5-Man Crew	1 lot	1,950	1 Day	All above surface.
1-M	Concrete Trash Bins	988 Loader 769B Truck 4-Man Crew	2 each	5,047	2 Days	Broken up and hauled to bathhouse site for disposal.
1-O	Power Substation Lower	Crane Flatbed Truck 5-Man Crew	1 lot	5,851	3 Days	
1-P	Power Substation Upper	Crane Flatbed Truck 5-Man Crew	1 lot	5,851	3 Days	
1-Q	69 KV Transmission Line	REMOVED BY OTHERS (UTAH POWER & LIGHT COMPANY) - NO COST CHARGED TO MINING.				
1-R	Footer Removal and Cleanup	988B 769B Truck 5-Man Crew	1 lot	13,772	5 Days	Small footers, culverts, and misc.
1-S	Removal of 84 Inch 1/2 Round Corrugated Metal Pipe	235 Excavator D8G Dozer 988B Loader Flatbed Truck 5-Man Crew	1 lot	10,962	3 Days	
			Subtotal	$155,163	74 Days	

RECLAMATION COSTS
PORTAL SEALING

ITEM #	DESCRIPTION	EQUIPMENT	QUANTITIES	UNIT COST	TOTAL COST	CONSTR. DAYS	COMMENTS
2-A	Portal Seals Includes Ventilation Portals	3-Man Crew Flatbed Truck Crawler Tractor	17	$ 2,516	$ 42,772	34	3 Little Dove 4 Beehive 10 Deseret
				Subtotal	$ 42,772	34	

BACKFILLING AND GRADING

ITEM #	DESCRIPTION	EQUIPMENT	HRS.	LABOR	HRS.	TOTAL	CONSTRUCTION DAYS
3-A	Beehive-Little Dove	D8G, 2 ea.	10.9	1 Supervisor	10.9	$ 4,743	1.4
		769B, 2 ea.	6.2	2 Operators	10.9		
		988	6.2	3 Operators	6.2		
3-B	Parking Lot Extension	235	14.2	1 Supervisor	15.9	8,491	2.0
		769B, 2ea.	15.9	3 Operators	15.9		
		825C	15.9	1 Operator	14.2		
		D8	2.4	1 Operator	4.1		
		988	1.7				
3-C	Parking Lot-Bathhouse-Warehouse	235	79.1	3 Operators	79.1	32,479	9.9
		769B	79.1	1 Supervisor	79.1		
		825C	79.1				
3-E	Haul Road - Remove and bury asphalt and road base	D8 Dozer	145.0	6 Operators	590.0	67,573	12.0
		621B, 3 ea.	100.0				
		825C	145.0				
3-F	Haul Road - Culvert Removal, Channel Reconstruction and lining	D8 Dozer	262.0	6 Operators	1450.0	184,230	45.0
		621B Scraper	783.0	1 Supervisor	360.0		
		825C Compactor	262.0				
		235 Excavator	143.0				
	Rip-rap lining material	5450 cyds @ $10/cyd				54,500	
				Subtotal		$352,016	68.3

TOXIC AND ACID FORMING

ITEM #	DESCRIPTION	EQUIPMENT	HRS.	LABOR	HRS.	TOTAL	CONSTRUCTION DAYS
4-A	Asphalt disposal (includes road base and contaminated materials)	988B	7.9	1 Supervisor	10.2	$ 4,769	1.3
		769C	7.9	1 Operator	10.2		
		825C	7.9	3 Operators	7.9		
		235	10.2				
				Subtotal		$ 4,769	1.3

INSTALL DRAINAGE CHANNELS

ITEM #	DESCRIPTION	EQUIPMENT	HRS.	LABOR	HRS.	TOTAL	CONSTRUCTION DAYS
5-A	Diversion, A and B	235	21.9	1 Supervisor	21.9	$ 12,911	2.7
		769B, 2 ea.	21.9	4 Operators	21.9		
		988B	21.9	2 Laborers	21.9		
5-B	Large Diversion	D8K	15.7	1 Supervisor	57.5	27,327	9.2
		825C	57.5	1 Operator	15.7		
		235	57.5	2 Operators	57.5		
		988B	15.2	3 Operators	15.2		
		769B, 2 ea.	15.2	2 Laborers	57.5		
		Riprap 3,169 c.y. x $11.00 Clay Liner 600 c.y. x $8.00				39,659	
5-C	Riprap Fan	988B	28.6	1 Supervisor	28.6	9,147	3.6
		235	28.6	2 Operators	28.6		
		Riprap 1,422 c.y. x $11.00				15,644	
				Subtotal		$104,688	15.5
6	Backfill Sediment Pond	D8K	90.8	1 Supervisor	90.8	$ 44,903	11.4
		621B, 2 ea.	90.8	4 Operators	90.8		
		825C	90.8				
				Subtotal		$ 44,903	11.4

SOIL SAMPLING & SEED BED PREPARATION

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
7-A	Soil Sampling 10 Tests	Drill Truck @ $300/Day	8.0	1 Operator 1 Helper	8.0	$ 760	1 Day
7-B	Laboratory Analysis (10 Samples)	Laboratory		Lab Cost @ $100/ea.		1,000	4 Days
7-C	Redistribute Topsoil	988B - 1 each	24.0	1 Operator	24.0	3,386	3 Days
7-D	Seed Bed Preparation			1 Supervisor	42.0	10,294	5 Days
	Hand Till	None		4 Laborers			
	Tractor Till	Tractor	128.0	1 Operator	128.0	4,114	16 Days
				Subtotal		$ 17,587	29 Days

FERTILIZING AND MULCHING

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
8-A	Fertilize 20.0 Acres	Flatbed Truck	41.0	1 Supervisor 3 Laborers	41.0	$ 5,375	5 Days
8-B,C,D	Mulch 20.0 Acres Net 10.5 Acres	Flatbed Truck	125.0	1 Supervisor 3 Laborers	125.0	16,487	16 Days
8-E	Haul Road	Hydroseeder Materials	150.0	None		12,750 51,750	19 Days
				Subtotal		$86,362	40 Days

SEEDING AND PLANTING

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
9-A	Seeding 20.0 Acres	Flatbed Tractor	40.0 11.0	1 Supervisor 3 Laborers	40.0	$ 5,464	5 Days
9-B	Transplanting 32,000 each	Flatbed Truck	171.0	1 Supervisor 3 Laborers	171.0	24,417	21 Days

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
9-C	Seed, Mulch, Fertilizer, Plants and Netting	None Material		None-Material		49,167	Material
9-D	Haul Road	Hydroseeder Materials	50.0	None		4,250 10,100	6 Days
				Subtotal		$188,255	32 Days

PLANT MONITORING DISEASE AND PEST CONTROL

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
10-A	Revegetation Monitoring	None		1 Supervisor 1 Laborer	40.0	$ (2,456)	(6 Days)
	Monitoring on 2, 3, 4, 5, 7, 10 Years = 6 Years @ $2,456/Year =					14,736	36 Days
10-B	Disease and Pest Control	None		1 Supervisor 1 Laborer	20.0	(1,228)	(2 Days)
	Control applied 2, 5, 7, 10 Years @ $1,228/Year					4,912	8 Days
10-C	Water Sampling (NPDES)	None		1 Supervisor	4.0	(147)	(1 Day)
	Monitoring 4 times each year for 10 years = 10 years @ $147 =					1,470	10 Days
10-D	Water Analysis (40 Samples @ $200)	Lab				8,000	(30 Days)
				Subtotal		$ 29,110	54 Days

SOIL STABILIZATION - RILLS AND GULLIES

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
11-A	Soil Stabilization Rills & Gullies	510 Backhoe	48.0	1 Operator 1 Laborer	48.0 48.0	$ (6,069)	(6 Days)
	Repeat work on 1, 2, 3, 6, 10th year = 5 years @ $6,069 =					30,345	30 Days
				Subtotal		$ 30,345	30 Days

4-11

CONTINGENT SEEDING AND PLANTING

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
12-A	Contingent Planting	Flatbed Hydroseeder	38.1 7.5	1 Supervisor 1 Laborer	38.1	$ 3,824	1 Day
	Materials					13,017	
				Subtotal		$ 16,841	

REVEGETATION INVENTORY FOR BOND RELEASE

ITEM #	DESCRIPTION	EQUIPMENT	HOURS	LABOR	HOURS	TOTAL COST	CONSTRUCTION DAYS
13-A	Vegetation Inventory	None		1 Supervisor 2 Laborers	72.0	$ 6,242	9 Days
	Repeat Inventory on 9th and 10th years = 2 years @ $6,242						
				Subtotal		$ 12,484	
				Mobilization		10,000	
				Construction Cost		1,140,470	
				10% Contingency		114,047	
	TOTAL CONSTRUCTION COST					$1,254,519	

NOTE: The following items have been deleted from the Reclamation Cost Schedule for the reasons indicated.

1-N Rock Dust Silo - Removed in 1988.
3-D Tipple Pad Slope Modification - Completed in 1984.

RECLAMATION COSTS

1. STRUCTURE REMOVAL - UNIT COSTS

A. CRANE, FLATBED TRUCK AND 5 MAN CREW

50 Ton Diesel Hydraulic Crane

$7,955/mo. x 1/22 = 361.59/day

Operating costs $26.70/hr. x 8 = 213.60/day

Total =	$	575.19/day

Diesel Flatbed Truck, 250 HP

$1,495/mo. x 1/22 = 67.95/day

Operating costs $7.75/hr. x 8 = 62.00/day

Total =		$	129.95/day
Crew			
Working Foreman		$	36.70/hr.
Heavy Equipment Operator			34.70
Truck Driver			27.05
2 Laborers (wrecking)	2 x		28.85
Total		$	155.65/hr.
$155.65 x 8 =		$	1,245.20/day

Cost Per Day

Crane	$	575.19
Truck		129.95
Crew		1,245.20
	$	1,950.34/day

B. 988 LOADER, FLATBED TRUCK AND 5 MAN CREW

988B Diesel Loader, 7 cubic yard bucket

$11,630/mo. x 1/22 = $528.64/day

Operating Cost $40.80/hr. x 8 = $326.40

Total =	$	855.04/day

Diesel Flatbed Truck See Section A	$	129.95/day
5 Man Crew See Section A		1,245.20/day
Cost Per Day	$	2,230.19/day

C. 988 LOADER, 769B TRUCK, 4 MAN CREW

988B Diesel Loader See Section C	$	855.04/day

769C Off Highway Truck, 35 Ton

$8,715/mo. x 1/22 = 396.14/day

Operating costs $25.10/hr. x 8 = 200.80/day

Total =	$	596.94/day

Crew

Working Foreman	$	36.70/hr.
2 Heavy Equipment Operators	2 x	34.20
Laborer (wrecking)		28.85
Total =	$	133.95/hr.
$133.95 x 8 =	$	1,071.60/hr.

Cost Per Day

Loader	$	855.04
Truck		596.94
Crew		1,071.60
	$	2,523.58/day

D. 988 LOADER, 769 TRUCK, 5 MAN CREW

988B Diesel Loader See Section B	$	855.04
769C Off Highway Truck See Section C		596.94

Crew

Working Foreman	$	36.70/hr.
2 Heavy Equipment Operators 2 x		34.20
2 Laborers (wrecking) 2 x		28.85
Total =	$	162.80/hr.
162.80 x 8 =	$	1,302.40

Cost Per Day

Loader	$	855.04
Truck		596.94
Crew		1,302.40
	$	2,754.38/day

2. PORTAL SEALING UNIT COSTS

Materials

Concrete Blocks 400 @ $1.00	$	400.00
Mortar 25 bags @ $2.60		65.00
Soil Backfill 150 cyds @ $2.00		<u>300.00</u>
	$	765.00

Equipment

Flatbed Truck 2 hrs./day

$1,495/mo. x 1/176 = $8.49/hr.

Operating cost = $7.75/hr.

$16.24/hr. x 2 hrs. x 2 days = $ 64.96/Portal

Crawler Tractor D6H

$5,700/mo. x 1/22 - $259.09/day

Operating cost $14.30/hr. x 8 = $114.40/day

Total = $ 373.49/day/Portal

Equipment Cost Per Portal	$	64.96
		<u>373.49</u>
		438.45

Crew

Brick Layer	$	33.05/hr.
Brick Layer's Helper		25.75/hr.
Equipment Operator		33.00/hr.
Truck Driver		27.05/hr.

Work Per Portal Unit

2 days block laying

1 day backfilling

4 hours trucking

2 days x Brick Layer	33.05 x 8	$ 528.80
2 days x Brick Layer's Helper	25.75 x 8	412.00
1 day x Operator	33.00 x 8	264.00
4 hours x Truck Driver	27.05 x 4	108.20
Total		$ 1,313.00/Portal

Cost Per Portal

Material	$ 765.00
Equipment	438.45
Labor	1,313.00
Total	$ 2,516.45/Portal

3. BACKFILLING AND GRADING

A. BEEHIVE/LITTLE DOVE EMBANKMENT

Description: The soil material from the portal pads will be dozed off to construct a 2H:1V earth slope. A loader on the Deseret pad will load two 769C Off Highway trucks which will haul the material back up to the Little Dove level where it will be placed against the highwall above the Little Dove Portal. A D8 dozer will be used to spread the material and construct the 2H:1V slope.

Production:

6000 cyds of material at the site

900 cyds will be used as portal seals

600 cyds estimated to be saved for rip-rap material

823 cyds for parking lot extension area

3677 cyds total to be moved

D8 Dozer Production - 338 cyds/hr. corrected

3677 cyds - 338 = 10.9 hours

Use two Dozers for 10.9 hours each to handle the material twice

988 Loader Production - 598 cyds/hr. corrected

3677 cyds - 598 = 6.2 hours

769C Truck Production - 30 cyds/cycle,

4.9 min/cycle, 50 min/hr.

3667 cyds - 30 x 4.9 - 50 = 12.0 hours

Use two 769C trucks - 6.2 hours each

Project Costs

D8 Dozer 2 x 10.9 x $63.00 =	$ 1,373.40
988 Loader 6.2 x $106.88 =	662.66
769C Trucks 2 x 6.2 x $74.62	925.29
	$ 2,961.34
1 Supervisor 10.9 hrs. x $36.70 =	$ 400.03
2 Operators 10.9 hrs. x $34.20 =	745.56
3 Operators 6.2 hrs. x $34.20 =	636.12
	$ 1,781.71
Total	$ 2,961.34
	1,781.71
	$ 4,743.05

B. PARKING LOT EXTENSION EMBANKMENT

Description: Soil from the Deseret Portal Pad is loaded and hauled to the areas of the Parking Lot Extension and placed as backfill. A 235 Backhoe Excavator is used to load the material on 769C Off Highway trucks. A 825 Compactor is used to spread and compact the soil on a 3H:1V slope. Additionally 823 cyds from the Little Dove Pad will be hauled.

Production:

7333 cyds of material on site

900 cyds to be used to seal the Deseret Portals

730 cyds estimated to be saved for rip-rap materials

1429 cyds for Bathhouse-Warehouse embankment

4274 cyds to be moved from Deseret Pad

823 cyds to be moved from Little Dove Pad

5097 cyds total

D8 Dozer 823 cyds at 338 cyds/hr. = 2.4 hrs.

988 Loader 823 cyds at 598 cyds/hr. = 1.4 hrs., use 1.7 hrs.

769C Trucks 240 cyds/hr./truck

823/(2 x 240) = 1.7 hrs.

235 Backhoe 4274 cyds at 300 cyds/hr. = 14.2 hrs.

769C Trucks 4274 cyds at 450 cyds/hr./truck

4279/(2 x 450) = 9.5 hrs., use 14.2 hrs.

Total time for 769C Trucks = 15.9 hrs.

825 Compactor 5097 cyds at 1604 cyds/hr.

5097/1604 = 3.2 hrs., use 15.9 hrs.

Project Costs:

D8 Dozer 2.4 hrs. x $63.00 $ 151.20

988 Loader 1.7 hrs. x $106.88	181.70
235 Backhoe 14.2 hrs. x $107.84	1,531.33
825C Compactor 15.9 hrs. x $88.85	1,412.72
769C Trucks 2 x 15.9 hrs. x $74.62	2,372.92
	$ 5,649.87

1 Supervisor 15.9 hrs. x $36.70	$ 583.53
3 Operators 15.9 hrs. x $34.20	1,631.34
1 Operator 14.2 hrs. x $34.20	485.64
1 Operator 4.1 hrs. x $34.20	140.22
	$ 2,840.73

Total	$ 5,649.87
	2,840.73
	$ 8,490.60

C. PARKING LOT/BATHHOUSE/WAREHOUSE EMBANKMENT

Description: Using a 235 Backhoe Excavator, the fill material is to be terraced back as shown on the cross sections to complete the terraces, additional material from the Deseret level and the Coal Stockpile area will be hauled. Placement of the fill and compaction will be done with a 825 Compactor.

Production:

16,296 cyds on Bathhouse level

1,429 cyds from Deseret Pad

5,869 cyds from Coal Stockpile Pad

23,594 cyds total to be moved

235 Backhoe 23,594 cyds at 300 cyds/hr. = 79.1 hrs.

769C Trucks 16,296 cyds at 420 cyds/hr. = 38.8 hrs., use 54.3 hrs.

1429 cyds at 450 cyds/hr. = 3.2 hrs., use 4.8 hrs.

5859 cyds, use 20 hrs.

Total = 79.1 hrs.

825C Compactor 23594 cyds at 1604 cyds/hr. = 14.7 hrs., use 79.1 hrs.

Project Costs:

235 Backhoe 79.1 hrs. x $107.84	$ 8,530.14
769C Truck 79.1 hrs. x $74.62	5,902.44
825C Compactor 79.1 hrs. x $88.85	7,028.04
	$21,460.62
1 Supervisor 79.1 hrs. x $36.70	$ 2,902.97
3 Operators 3 x 79.1 hrs. x $34.20	8,115.66
	$11,018.63
Total	$21,460.62
	11,018.63
	$32,479.25

E. Des-Bee-Dove to Cottonwood/Wilberg Haul Road

Remove asphalt and road base material and place it at the north end of the road to be covered with 4 feet of non-toxic soil.

1. Rip existing asphalt with D8 Dozer 18 inches deep, 4 foot spacing of passes, 300 feet per pass at 1 mile per hour.

   $300 \text{ ft.} \times \frac{88 \text{ ft.}}{\text{min.}} = 3.41 \text{ min./ } 300 \text{ ft. pass}$

   Add .25 min. for turning around

   3.41 + .25 = 3.66 min./300 ft. pass

   36' wide - 4 ft./pass = 9 passes for fill width

   3.66 min./pass x 9 passes = 32.9 min./300 ft.

   18,350 ft. long/300 ft. = 61.16

   Total Time = 61.16 x 32.9 = 2012 min.

   Use 45 min./hr. efficiency

   $\frac{2012 \text{ min.}}{60} \times \frac{60}{45} = 45 \text{ hours}$ D8 Dozer

2. Haul loosened asphalt and road base

   Quantity = 31,255 cyds

   Average haul distance = 5078 ft.

   Change in elevation = 365 feet

   Average slope = 365/5078 x 100% = 7.2%

   Caterpillar 621 B Scrapers

   Load time = 0.7 min./cycle

   Maneuver and spread time = 0.7 min./cycle

Loaded travel time = 4.6 min.

Empty travel time = 2.6 min.

Total cycle time = 4.6 + 2.6 + .7 + .7 = <u>8.6 min.</u>

Production per load = 20 cyds heaped

Number of loads = 31,255 / 20 = 1563 loads

Time required = $1563 \times \dfrac{8.6 \text{ min.}}{60 \text{ min./hr.}} = 224$ hrs.

At 45/min./hour efficiency

224/.75 = 299 hours 621 B Scrapers

With 1 Dozer for 3 Scrapers

299 hrs./3 = 100 hours D8 Dozer

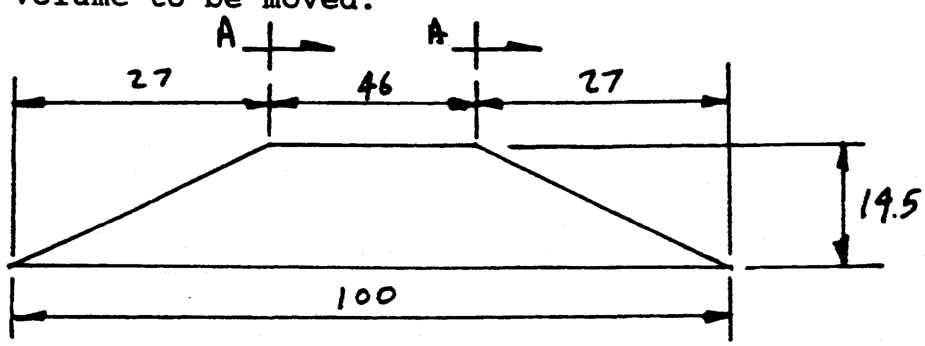
Production estimation from <u>Caterpillar Performance Handbook, Edition 7</u>, October 1976.

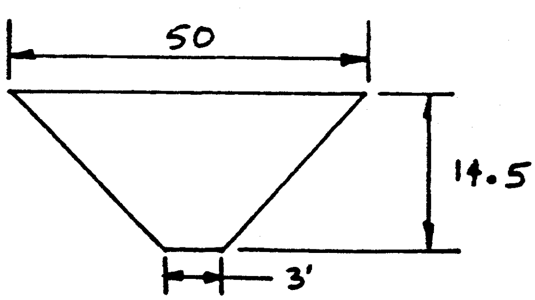
F. Des-Bee-Dove to Cottonwood/Wilberg Haul Road.

Remove culverts, reestablish drainage channels and install rip-rap linings.

1. Remove culverts which are not replaced with drainage channels. Eight 24 inch culverts totaling 800 feet, average depth = 14.5 feet at center line.

Volume to be moved:





Section A

$$\text{Area A} = \frac{(50 + 3)}{2} \times 14.5$$

$$\text{AA} = 384 \text{ ft.}^2$$

$$\text{Volume} = \frac{(0 + AA)}{2}\, 27 + \frac{(AA + AA)}{2}\, 46 + \frac{(0 + AA)}{2}\, 27$$

$$= \frac{27AA}{2} + 46AA + \frac{27AA}{2} = 73AA$$

$$= 73\ (384) \times \frac{1}{27} = 1038 \text{ cyds/culvert}$$

Total for 8 culverts = 8306 cyds

One each 42 inch culvert, 226 ft. long 42 feet deep at center line

Volume = 14,171 cyds

Total for all culverts = 22,477 cyds

Production for CAT 235 Excavator with 1.50 cyd bucket

360 cyds/hr. @ 15 sec. cycle time

Time to move 22,477 cyds

$$\frac{22{,}477}{360} \text{ cyds} = 62.4 \text{ hours}$$

at 45 min./hr efficiency

62.4/.75 = 83 hours CAT 235 Excavator

2. Excavate for drainage channels and haul material to backfill area.

Channel #3 - 107,515 cyds of excavation to be hauled

1375 feet up an 8% grade with a Caterpillar 621B Scraper

Loaded travel time = 1.5 min.

Empty travel time = 1.0 min.

Fixed time = 1.4 min.

Cycle time = 3.9 min.

Number of loads = 107,515/20 cyds/load = 5376 loads

Time required = 5376 loads x 3.9 min./cycle = 20,966

min. @ 45 min./hr. efficiency

Total time $\frac{20,966 \text{ min.}}{60 \text{ min./hr.}} \times \frac{60 \text{ min.}}{45 \text{ min.}}$ = 466 hours

621B Scraper

466/3 = 155 hours D8 Dozer

Channel #4 10,656 cyds, 670', +8% grade

Equipment time

29 hours 621B Scraper
10 hours D8 Dozer

26,329 cyds, 984', -8% grade

Equipment time

85 hours 621B Scraper
28 hours D8 Dozer

Channel #5 2560 cyds, 1022', -8% grade

Equipment time

8 hours 621B Scraper
3 hours D8 Dozer

Channel #7 13,200 cyds, 420', -1.9% grade

Equipment time

29 hours 621B Scraper
10 hours D8 Dozer

10,893 cyds, 1068', -7.1% grade

Equipment time

31 hours 621B Scraper
10 hours D8 Dozer

Channel #8 838 cyds, 564', -7.1% grade

Equipment time

2 hours 621B Scraper
1 hour D8 Dozer

Channel #10 25,579 cyds, 796', +7.1% grade

Equipment time

68 hours 621B Scraper
23 hours D8 Dozer

Channel #11 611 cyds, 801', +2.46% grade

Equipment time

2 hours 621B Scraper
1 hour D8 Dozer

Channel #12 552 cyds, 1470', +2.46% grade

Equipment time

2 hours 621B Scraper
1 hour D8 Dozer

Channel #13 529 cyds, 729', +2.46% grade

Equipment time

1 hour 621B Scraper

Channel #14 14,296 cyds, 630', +2.46% grade

Equipment time

33 hours 621B Scraper
11 hours D8 Dozer

11,475 cyds, 505', -2.46% grade

Equipment time

26 hours 621B Scraper
9 hours D8 Dozer

Channel #15 674 cyds, 60', +2.46% grade

Equipment time

1 hour 621B Scraper

Total equipment time

783 hours 621B Scraper
262 hours D8 Dozer
262 hours 825B Compactor

3. Install rip-rap lining

CHANNEL	RIP-RAP VOLUME cyds	D100 SIZE inches
3	2150	60
4	500	30
5	145	17
7	140	18
8	89	12
10	300	22
12	77	9
13	84	12
14	1920	46
15	48	9
	5453 cyds	

One half of the total will be recovered from existing stockpiles or excavation performed during the project. Filter material quantity equals one half the rip-rap total. Equipment time for placing rip-rap:

CAT 235 Excavator

Use 180 cyds per hour

$1.5 \times 5453/180 = 45$ hrs @ 45 min./hr. $= 45 \times \frac{1}{.75} = 60$ hr.

4. TOXIC AND ACID FORMING

A. REMOVE AND BURY ASPHALT

Description: Using a 235 Backhoe and 988 Loader, the asphalt will be removed from the access road to the Tipple Yard and to the Bathhouse level and Parking Lot. 769C Off Highway trucks will haul the material and a 825C Compactor will spread and compact it.

Production:

510 cyds on Access Road

2317 cyds on Parking Lot

2826 cyds total

235 Backhoe 2827 cyds at 278 cyds/hr. = 10.2 hrs.

988 Loader 2827 cyds at 359 cyds/hr. = 7.9 hrs.

769C Trucks 510 cyds at 390 cyds/hr. = 1.3 hrs.

2317 cyds at 660 cyds/hr. = 3.5 hrs., use 7.9 hrs.

Total time for 769C = 7.9 hrs.

825C Compactor 2827 cyds at 1604 cyds/hr. = 1.76 hrs., use 7.9 hrs.

Project Costs:

235 Backhoe 10.2 hrs. x $107.84 =	$ 1,099.97
988 Loader 7.9 hrs. x $106.88 =	844.35
769C Truck 7.9 hrs. x $74.62 =	589.50

825C Compactor 7.9 hrs. x $88.85 =	701.92
	$ 3,235.74
1 Supervisor 10.2 hrs. x $36.70 =	$ 374.34
1 Operator 10.2 hrs. x $34.20 =	348.84
3 Operators 3 x 7.9 hrs. x $34.20 =	810.54
	$ 1,533.72
Total	$ 3,235.74
	1,533.72
	$ 4,769.465.

5. INSTALL DRAINAGE CHANNELS

A. CONSTRUCT DIVERSIONS A AND B

Description: Two small diversions will be built, as shown on drawing, to carry water across fill areas. Use the 235 Excavator to dig channel. 235 Excavator and two 769B trucks will be used to place rip-rap.

Equipment:

235 Excavator

769B Truck, 2 ea.

988B Loader

Labor:

5 Operators

2 Laborers

Quantities:

Rip-rap 850 c.y. (from the site)

Gravel liner 212 c.y. (from parking lot)

Clay liner 318 c.y. (off site)

Production: Excavation

Cross-section of ditch: 12 $ft.^2$ = .5 c.y./lin. ft.

Cycle time: 0.5 min./2 c.y. = 8 lin. ft./min.

200 lin. ft./hr.

60% efficiency x 200 = 120 lin. ft./hr.

1275 - 120 = 10.6

Line Ditch

2.5 c.y./min. for rip-rap

Double time for liners

75 c.y./hr.

805 - 75 = 11.3 hrs.

Total 11.3 + 10.6 = 21.9 hrs.

B. CONSTRUCT LARGE DIVERSION

Description: Using a D8K Dozer the trench will be cut across the yard area as shown. The excavated material is spread over the adjacent area. The liners and rip-rap will be purchased from a local contractor and delivered to the site as needed. An 825C Compactor will be used to place the liners. A 235 Excavator will be used to place the rip-rap.

Equipment:

D8K Dozer

826B Compactor

235 Excavator

988 Loader

769B Truck, 2 ea.

Labor:

6 Operators

2 Laborers

Quantities:

1136 c.y. rip-rap (from site)

3,169 c.y. rip-rap (off site)

574 c.y. gravel (from parking lot)

861 c.y. liner (off site)

3,407 Excavation

Production: Excavation

Average haul distance 200'

450 c.y./hr. (.75) (.80) (.67) (1.2) = 217 c.y./hr.

3,407 - 217 = 15.7 hrs.

Line Ditch (based on rip-rap)

75 c.y./hr.

3,169 - 75 = 42.3 hrs.

On-site material

1,136 - 75 = 15.2 hrs.

C. RIP-RAP FAN

Description: Part of the final diversion drainage system is to build an energy dissipator, to channel the water off the large fill onto natural terrain. Rip-rap will be purchased from a local contractor and hauled to the site. A 988 Loader is used to deliver the rip-rap to the site which will be placed by the 235 Backhoe.

Equipment:

988B Loader

235 Backhoe Excavator

Labor:

2 Operators

Quantities:

2,402 c.y.

Production:

Cycle time: 5 min./7 c.y.

84 c.y./hr.

2,402 c.y. - 84 = 28.6 hrs.

6. BACKFILL SEDIMENT POND

Description: Using material from the spoil piles developed during construction of the pond will be backfilled after the bonding period is complete.

Equipment:

D8K Dozer

621B Scraper, 2 each

825C Compactor

Labor:

4 Operators

Quantities:

30,976 c.y.

Production:

Average haul distance 500' at +10%

Average cycle time 3.7 min./14 c.y.

2 units x 227 c.y./hr. = 454 c.y./hr.

75% efficiency = 341 c.y./hr.

30,976 - 341 = 90.8 hrs.

7. SOIL SAMPLING AND SEEDBED PREPARATION

A. Soil sampling per DOGM guidelines. All areas of existing embankment that will be redistributed as topsoil. This includes soils excavated for channel construction.

B. Scarification of old road beds for knitting topsoils or regrading.

C. Upon asphalt removal, redistribution of clean gravels for channel reconstruction (filter beds).

D. Surface preparation, steep slopes exceeding 25% (15°), is handwork. Slopes less than 25% will utilize a tractor and drag implement to accomplish surface preparation.

Equipment:	Soil Drill, Tractor and Implements	
Labor:	1 Operator, 4 Laborers	
Production:	Soil Samples	8 Hours

Redistribution Topsoil

Equipment:	988 B	
Labor:	1 Operator	
Hours:		24 Hours

Seedbed Work:

a.	Hand tilling @ 4 Hrs/ac - 10.5 ac.	42 Hours
b.	Tractor tilling @ 2 Hrs/ac - 64 ac.	128 Hours
	Total Hours	194 Hours

8. SOILS, FERTILIZATION, MULCHING

A. Fertilize - Broadcast 20.0 Acres

B. Planting Seed and Plants (see Item #9)

C. Mulch - Spread Hay Bales - 20.0 Acres

D. Spread and Staple Netting - 10.5 Acres

Equipment:	Flat-bed Truck	
Labor:	1 - Working Foreman 3 - Laborers	
Quantities:	Fertilize (hand-work) 20.0 Acre Mulch 2" cover - 2 Tons/Acre Install Nylon Netting 10.5 Acre	
Work Time:	Haul, Spread and Rake Fertilizer 125#/Acre - 20.0 Acre 2,500 lbs.	41 Hours
	Haul, Spread, Mulch 2 Tons Per Acre - 20.0 Acres	41 Hours
	Haul, Spread and Staple Nylon Netting 10.5 Acres	84 Hours
		166 Hours

E. Haul Road Revegetation (50 Acres)

Equipment:	Hydroseeder (includes operators)
Labor:	None
Materials, Quantities & Cost:	Soil Enhancer - 250 lbs./acre x 50 acres = 12,500 lbs., 12,500 lbs x $.38/lb. = $4,750
	Fertilizer - 500 lbs./acre x 50 acres = 25,000 lbs., 25,000 lbs. x $.20/lb. = $5,000
	Sulfur - 1,000 lbs./acre x 50 acres = 50,000 lbs., 50,000 lbs. x $.24/lb. = $12,000

Mulch - 1,500 lbs./acre X 50 acres = 75,000 lbs.
75,000 lbs. x $.20/lb. = $15,000

Tackifier - 50 gal./acre x 50 = 2,500 gals.
2,500 gals. x $6.00/gal. = $15,000

Hydroseeder - 3 hrs./acre x 50 acres = 150 hrs.
150 hrs. x $85/hr. = $12,750

Total	$64,500

9. SEEDING AND PLANTING

A. Broadcast and rake 480 lbs. of mixed seeds.

B. Transplant 32,000 each containerized plants.

Equipment: Flat-bed Truck
Farm Tractor & Implements

Labor: 1 - Working Foreman
3 - Laborers

Quantities:

Pinyon-Juniper
20 Acres

Seeding 24 lbs./acre
Transplants 1,600/acre

Production: Broadcast seed @ 2 hrs./acre
Transplant 500 ea./man-day

Pinyon-Juniper
20 Acres

Seeding	40 Hrs.
Transplanting	171 Hrs.
	211 Hrs.

C. Seed, Mulch, Fertilizer, Plants and Netting

Equipment: Hydroseeder (Includes Operators)

Materials, Quantities & Costs:

Seed - 20 acres X 24 lbs./acre = 480 lbs.
480 lbs. X $8.00/ lb. = $3,840

Seed - 8 acres X 25.25 lbs./acre = 202 lbs.
202 lbs. X $8.00/lb. = $1,616

Plants - 20 acres X 1600/acre = 32,000 plants
32,000 X .75/ea. = $24,000

Mulch - 20 acres X 2 tons/acre = 40 tons
40 tons X $100/ton = $4,000

Mulch - 8 acres X 1500 lbs./acre = 12,000 lbs.
12,000 lbs. X $.20/lb. = $2,400

Fertilizer - 20 acres X 125 lbs./acre = 9,313 lbs.
9,313 lbs. X $.20 = $1,863

Fertilizer - 8 acres X 500 lbs./acre = 4,000 lbs.
4,000 lbs. X $.20 = $800

Soil Enhancer - 8 acres X 250 lbs./acre =
2,000 lbs.
2,000 lbs. X $.38/lb = $760

Sulfur - 8 acres X 1,000 lbs./acre = 8,000 lbs.
8,000 lbs. X $.24/lb = $1,920

Tackifier - 8 acres X 50 gals/acre = 400 gal.
400 gal. X $6.00/gal = $2,400

Hydroseeder - 8 acres X 3 hr./acre = 24 hr.
24 hr. X $85.00/ hr. = $2,040

Netting - 10.5 acres X $336.00/acre = $3,528

Total $49,167

D. Haul Road Revegetation (50 acres)

Equipment: Hydroseeder (includes operators)

Materials, Quantities & Costs:

Seed - 25.25 lbs./acre X 50 acres = 1,262 lbs.
1,262 lbs. X $8.00/lb. = $10,000

Hydroseeder - 1 hr./acre X 50 acres = 50 hrs.
50 hrs. X $85/hr. = $4,250

Total $14,350

10. MONITORING AND PEST CONTROL

A. Revegetation

Labor: 1 - Supervisor
1 - Laborer

40 hours/year for 6 years includes hand cultivation as required.

B. Disease and Pest Control

Labor: 1 - Supervisor
1 - Laborer

20 hours/year for 4 years, additional year for contingency.

C. Water Sampling

Labor: 1 - Supervisor

4 hours/year for 10 years.

D. Water Analysis

Lab: 40 samples at $200/sample

11. SOIL STABILIZATION

A. Rills and Gullies

Description: A rubber tired JD510 backhoe and two laborers are used. The time required is based on our past history and expanded to cover the increased acreage.

Equipment: JD510 Backhoe

Labor: 1 - Operator
1 - Laborer

Production: 48 hours, 6 days

Work will be during years 1, 2, 3, 6, and 10.

5 years x 6 days = 30 days work = 240 hours

12. CONTIGENT SEEDING AND PLANTING

A. Reseed and Replant Unsuccessful Areas (estimated 10%)

Equipment:	Flat-bed Truck
Labor:	1 - Foreman
	1 - Laborer
Quantities & Production:	10% of Item #9

13. INVENTORY FOR BOND RELEASE

A. Inventory Reference Sites and Revegetated Areas

Equipment:	None	
Labor:	1 - Supervisor 2 - Laborers	
Quantities:	2 Reference Sites 2 Revegetated Areas	
	a. Pinyon-Juniper	20.0 Acres
	b. Desert Shrub	129.5 Acres
	TOTAL ACRES	149.5 Acres
Production:	Site Inventory - 4 ea.	48 Hrs.
	Each Reference Site - 2 each	24 Hrs.
	TOTAL HOURS	72 Hrs.

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/Wilberg 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, Volume 9, 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.

A survey to locate structures on East Mountain that could be affected by subsidence has been completed and none were located above Des Bee Dove Mine.

There are no electrical power lines, oil or gas wells, pipelines or other utility structures which would be affected by surface subsidence within the Des Bee Dove Mine limits.

MINING METHOD

The coal reserves in the Des Bee Dove complex have been mined using room and pillar methods. The remaining reserves will also be mined in this way.

Room and Pillar mining methods using final pillar extraction 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.

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.

Full extraction areas (room-and-pillar panels with pillar removal) 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 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.

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

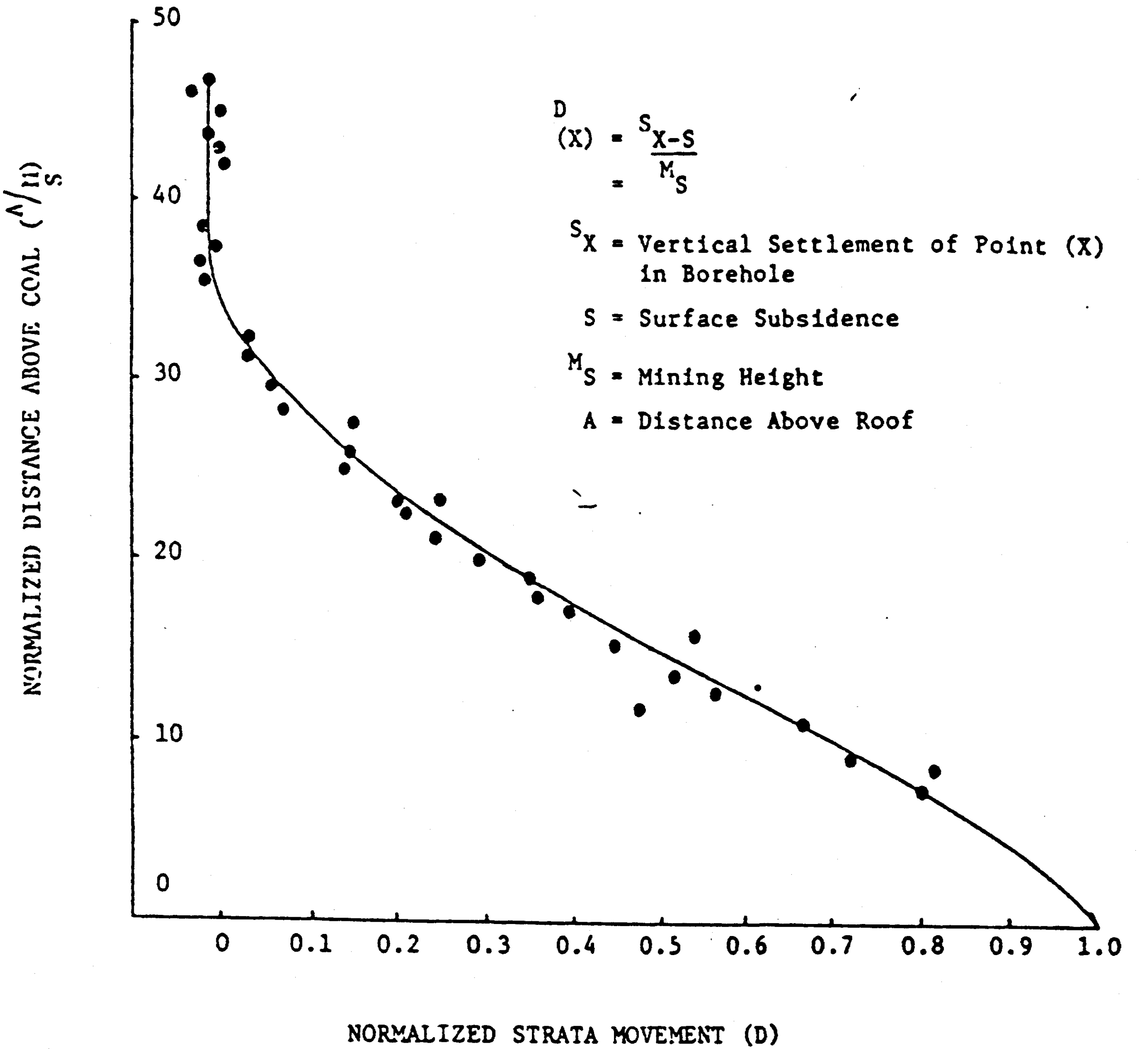


FIG. 1. Vertical settlement of overburden above a longwall panel (after Dahl and Von Schonfeldt)

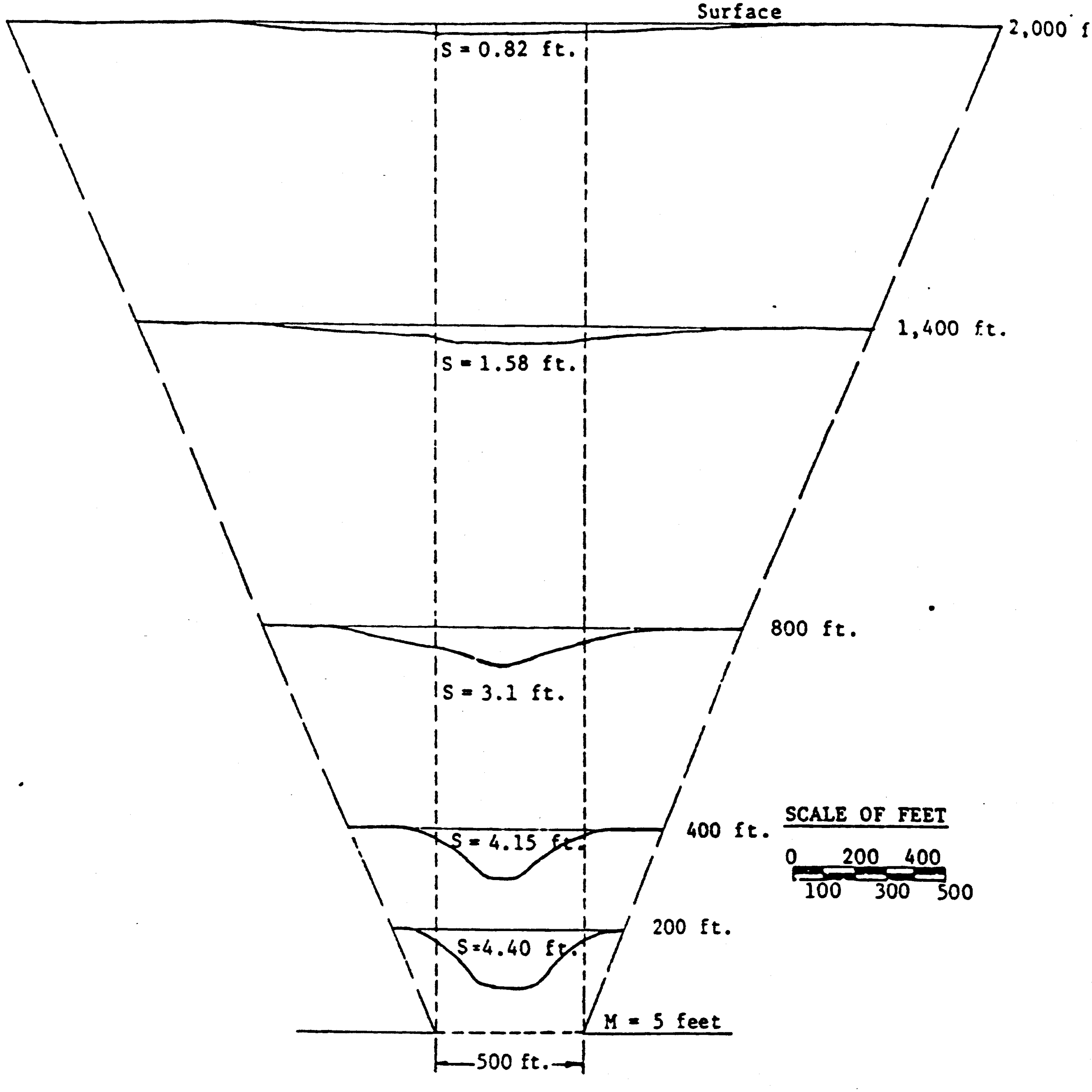


FIG.2. Varying subsidence profile at different horizons.

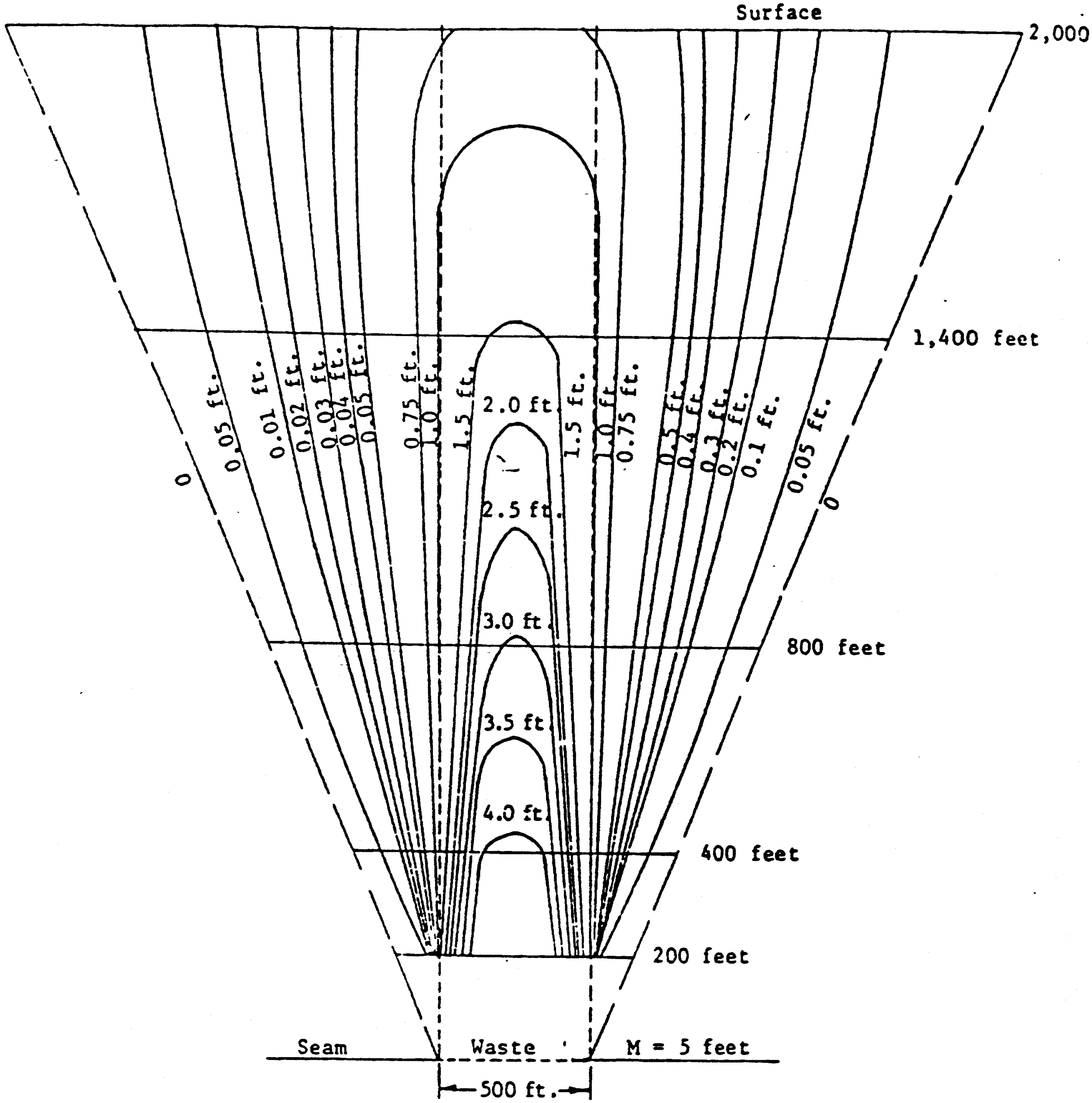


FIG. 3. Lines joining points of equal subsidence.

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 allows 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.

MITIGATION OF SUBSIDENCE DAMAGE EFFECTS

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.

As discussed in the Hydrology Section, drainages located within the Des Bee Dove permit area are ephemeral. No pre-mining use of these drainages has been documented and no post-mining use is anticipated. There is one spring within the permit area, referred to in the East Mountain Spring Monitoring Program as 82-51 (see Map HM-5 in Hydrology Section). Spring 82-51 is located in Section 26, Township 17 South, Range 7 East. The spring has a relatively low flow rate of less than 5 GPM during average precipitation years and normally flows only during the months of June and July. Within the area of spring 82-51, mining of the Blind Canyon Seam (Little Dove Mine) was completed in 1986 and mining of the Hiawatha Seam (Deseret Mine) is planned during the fifth year after production resumes. Annual monitoring of the spring has not revealed any related impacts due to mining.

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.

FULL EXTRACTION MINING UNDER DES BEE DOVE CASTLE GATE SANDSTONE EXCARPMENT

Historically, two full extraction pillar sections have been completed under the Des Bee Dove Castle Gate Sandstone Escarpment. These include full extraction of; the 6th East pillar section (Deseret Mine) and 8th East pillar section (Beehive Mine). Multiple seam mining has occurred within these two sections under the Castle Gate Sandstone Escarpment with no evidence of failure to the escarpment.

Beehive Mine 2nd North off 8th West has been completely extracted by room and pillar mining methods. The pre-mining condition of the Castle Gate Sandstone Escarpment in this area contained closely-spaced jointing and coal outcrop burn-induced fractures. This caused natural instability within the escarpment. The 2nd North area off 8th West was then surrounded by weak clinker-bed basement material susceptible to crushing. These instabilities coupled with room and pillar mining caused open fractures in the escarpment for this area.

Previous Des Bee Dove Mine room and pillar areas have encountered numerous areas where burned coal and clinker beds surround the mine workings. Future mining is projected and oriented to minimize extraction exposure and avoid creating further instabilities in the mining horizon.

In the East Mountain reserve, room and pillar mining has a lower total recovery percentage than longwall mining. Overall subsidence is substantially less than longwall mining (see Figure 4).

Room and pillar extraction panels in the Des Bee Dove Mine are planned to average 300' wide. This relates to 60% less area being affected over time when compared to longwall mining. This will help to minimize possible surface and escarpment disturbance over time.

Room and pillar mining designs and layouts for the Des Bee Dove Mine are planned so that possible surface disturbance due to full extraction mining will be minimized.

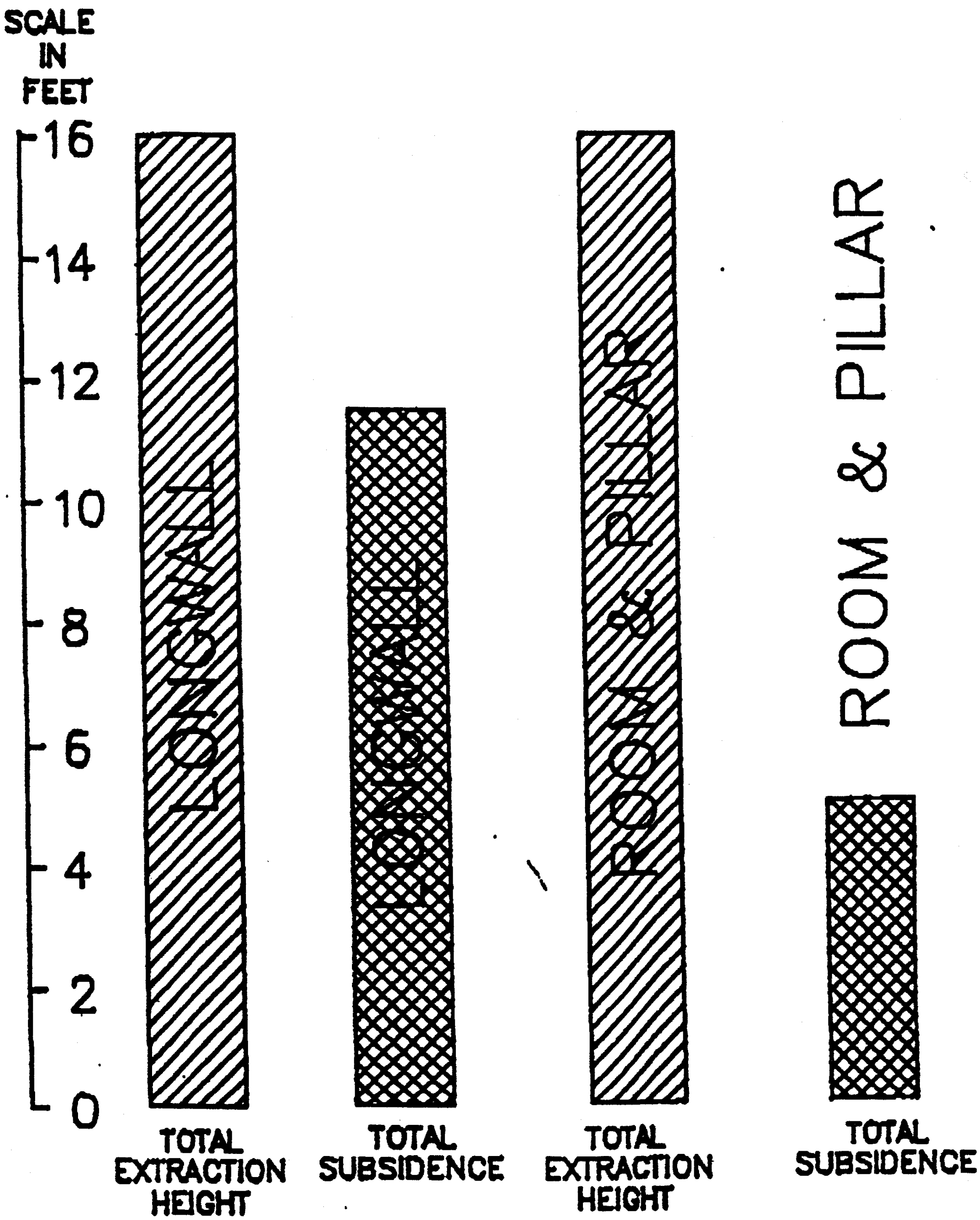
Des Bee Dove future mining projections are oriented so that full extraction areas do not encounter burned coal and associated clinker-bed instabilities.

Mitigation measures will be taken if damage should occur to the escarpment due to full extraction room and pillar mining in the Des Bee Dove Mine.

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

FIGURE 4
LONGWALL vs. ROOM & PILLAR
ACTUAL MULTISEAM
SUBSIDENCE CHARACTERISTICS



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.

PROTECTION OF FISH AND WILDLIFE (R614-301-358)

The portal facilities of the Des Bee Dove Mine are located in a small dry wash, a tributary to Grimes Wash. This active area (portal facilities) consists of about 20 acres and is physically separated from the remaining permit area by imposing and inaccessible mountain slopes that rise over 1,600 feet vertically from the active portal area.

Excepting the occasional use for exploration, the wildlife inhabitants on top of East Mountain are relatively unaffected during the mining operation and require no special plans other than the hydrological and subsidence monitoring now initiated.

There are no prime fisheries located on the East Mountain plateau within the permit area.

In contrast to the lush mountain top environment above the mines the portal areas are situated within a transition zone of the plateau with a southeastern facing aspect. Vegetation and wildlife are sparse in comparison.

An on-the-ground review was made in consultation with the US Fish and Wildlife Service, DOGM and Division of Wildlife Resources. No critical habitat of threatened or endangered species was identified.

A 69 KV line serves as the power source for the Des Bee Dove complex. Mostly single pole and suspension insulators, this transmission line provides sufficient phase to phase and phase to ground clearances to preclude electrical contact of raptors including eagles. The structure types are approved as eagle-safe by the US Fish and Wildlife Service by letter dated 11/10/82 to the DOGM. Any fences constructed will allow unrestricted movement of wildlife. Toxic forming and other hazardous materials are handled as described in the PAP, in such a manner as to preclude exposure to wildlife.

RAPTOR NESTS MITIGATION PLAN

Generally, raptor habitat associated with East Mountain is synonymous with the prominent and precipitous cliffs which form the upper reaches of the plateau. A broad strip of land with a varying width between 3,000 and 5,000 feet as shown on the drawing in Map Packet 2-17. This map is designed to reflect the habitat and found nest sites from surveys conducted in 1981, 1982 and 1986 through 1989.

Of the golden eagle nests within and adjacent to the Des Bee Dove permit area (Map 2-17B), only nests 56B and 87C are located within areas of proposed future mining. Both of these nest sites overlie barrier pillars which will be left unmined to protect the main entries as discussed on Page 3-7.

Annual nest inventory flights, conducted by UDWR, USFWS, and applicant personnel since 1986, have failed to locate nests 56A (previously identified as nest 56) and 54 which were inventoried by USFWS personnel in 1981 and 1982. Therefore, it appears that these nests no longer exist or their original locations may have been misidentified.

All other nest sites are located beyond projected full-extraction mining potential impact areas proposed in future mining plans.

No future mining is planned in areas which contain raptor nests; therefore, no impacts to nests are expected.

Although Grimes Wash is not a fishery it is a tributary to Cottonwood Creek (Straight Canyon) which is a limited fishery. Protection from coal dust and increased sediments to these waters is by a sedimentation pond installed for control of sediment and coal dust from storm runoff waters. Coal is transported by trucks on hard-surfaced roads. Truck covers are not necessary as the moisture of processed coal is sufficient to prevent blowing coal dust; plus the loaded coal truck negotiating the 12% grade are limited to slow speeds.

To reduce the undue disturbance and killing of wildlife, the video produced by UDWR at Price has been obtained to instruct all the employees of the value of all wildlife and problems inherent to Utah wildlife. This video is shown at scheduled employee training sessions so all employees new or old will have viewed this series. This series explains the effect of harassing wildlife during their different life stages and the needs of species resident of Utah.

Signs will be placed on the Des Bee Dove haul road in the permit area to notify drivers of the presence of deer in the area. A flyer containing the following information on avoiding deer vehicle collisions will be distributed during training to all employees.

1. Driver are to be aware of deer in the area.
2. Be aware that deer are most active at night and during dawn and dusk.
3. At night flash lights at deer on road to break their trance and allow them to react to the oncoming vehicle.
4. Each deer is worth $1,100 to the economy of Utah.

This instruction will also include the precaution of shooting at raptors perched on the transmission line adjacent to the haul road and access road.

The UDWR presently conducts a deer road-kill monitoring program which includes the Des Bee Dove Mine access road. The program functions to monitor road-kills and identify significantly hazardous areas for the purpose of initiating mitigating measures to reduce the incidence rate. Road-kills observed by mine personnel will be reported to the UDWR to aid them in their monitoring program.

Information regarding mule deer seasonal distribution and numbers within the permit is not available due to the dynamic characteristics of the deer herds involved. UDWR personnel indicate such information would not be truly representative of the demographics of the deer population; therefore, it is not available from them.

If hazardous areas are identified on the Des Bee Dove Mine access road, within the permit area, appropriate mitigating measures will be instituted based on consultation with UDWR personnel.

Personnel involved will be apprised of the critical value of snake dens. They will be advised to be particularly observant for concentrations of snakes during the months of April, May, September and October. Such concentrations indicate the presence of snake dens. If a den is located, it will be reported to the UDWR for assistance in the necessary mitigating measures.

Surface water disturbance due to subsidence on East Mountain from mining activities in the Des Bee Dove Mine will be replaced or repaired by the following methods:

1. Streams will be bridged across bedrock fractures by culverts until sediment fills the crack.
2. Springs and seeps proven to be lost to subsidence action will be replaced as approved by the Division in consultation of the surface management agency.

The interim reclamation plans provide for the stabilization of all the fill slopes with a vegetative cover. Because the fill slopes are intertwined with the mine facilities, the planting mixture is designed more for soil stabilization than for an attraction to wildlife. The large mammals especially would be a nuisance in and around the operation and the operations a hazard to them. The final reclamation plan will restore the stream channels and revegetate the disturbed sites. The revegetation mixture of forbs, grasses, shrubs and trees is similar to the adjacent native plant communities and will provide forage and cover for wildlife. In addition to grouping and layering of containerized shrub and tree species, as discussed in the Final Revegetation Section, terrestrial habitat enhancement measures will include the construction of rock piles.

Rock piles of varying sizes will be placed at various locations and proximities to provide enhanced habitat for small mammals. The construction and location of the rock piles will be coordinated with DOGM, UDWR, USFS and USFWS personnel.

The UDWR general mitigation plan for the East Mountain area follows. Applicant has stated compliance to these recommendations insofar as they are applicable.

The Applicant will not use persistent pesticides on the area during mining and reclamation activities, unless approved by the Division.

R614-301-322 FISH AND WILDLIFE RESOURCE INFORMATION

PACIFICORP, DEER CREEK MINING PROJECT

General Wildlife Resource Information - All Species of Vertebrate Wildlife

The mine plan area encompasses a portion of the Wasatch Plateau in Emery County, Utah. This area drains into Huntington Creek and on into the San Rafeal River, which flows into the Green River and ultimately into the Colorado River at a point upstream from Lake Powell. Generally speaking, the Wasatch Plateau is encompassed by cold desert (upper Sonoran life zone), submontane (Transition life zone) and montane (Canadian, Hudsonian and Alpine life zones) ecological associations. These life zones could be inhabited on occasion and during different seasons of the year by about 364 species of vertebrate wildlife - 14 fish species, 6 amphibian species, 18 reptile species, 242 bird species and 84 mammal species. It is interesting to note that 83 percent of these species are protected.

The mine plan area itself is represented by the Transition and Canadian life zones and provides habitat for approximately 239 species of wildlife - 5 fish species, 6 amphibian species, 17 reptile species, 136 bird species and 75 mammal species. Fifty-eight of these species are of high interest to the State of Utah.

The Division Publication No 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" is referenced to this report since it represents a low level of study for the wildlife species listed. It identifies those species having potential to inhabit the region as well as those inhabiting the environs of the mine plan area. It also identifies which species are considered to be of high interest for the habitats and local area represented.

High interest wildlife are defined as all game species; any economically important species; and any species of special aesthetic, scientific or educational significance. This definition would include all federally listed, threatened and endangered species of wildlife.

A ranking and display of wildlife habitats and use areas relative to high interest species of vertebrate wildlife has been developed (Table 1 and 2 and the attached map). Critical wildlife use areas followed in respective importance by high-priority, substantial value and limited value wildlife use areas require various levels of protection from man's activities and developments. Wildlife habitats and use areas are ranked as being of critical or high-priority value to wildlife should be protected from surface disturbance, subsidence impacts and human or industrial disturbance. This can be accomplished through development and implementation of a wildlife plan.

Critical wildlife use areas are "sensitive use areas" necessary to sustain the existance and perpetuation of one or more species of wildlife during crucial periods in their life cycles. These areas are restricted in area and lie within high-priority wildlife use areas. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 1 or 2 are classified as being critical. Biological intricacies dictate that significant disturbances cannot be tolerated by the members of an ecological assemblage on critical sites. Professional opinion is that disturbance to critical use areas or habitats will result in irreversible changes in species composition and/or biological productivity of an area.

High-priority wildlife use areas are "intensive use areas" for one or more species of wildlife. "Intensive use areas" are not restricted in area and in conjunction with limited value use areas form the substantial value distribution for wildlife species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 3 are classified as being of high-priority. In addition, wildlife use areas where surface disturbance or underground activities may result in subsidence that could interrupt underground aquifers and result in a potential for local loss of ground water and decreased flows in seeps and springs should be considered as being of high-priority to wildlife.

Substantial value wildlife use areas are "existence areas" for one or more species of wildlife. "Existence areas" represent a herd or population distribution and are formed by the merging of high-priority and limited value wildlife use areas for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 4 are classified as being of substantial value.

Limited value wildlife use areas are "occasional use areas" for one or more species of wildlife. "Occasional use areas" are part of the substantial value wildlife use area for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 5 or 6 are classified as being of limited value.

MAPPING

Vegetation and Wildlife Habitats

It is recommended that the Company's primary effort be placed on identifying species of vegetation in each wildlife habitat within the various wildlife use areas for purposes of reclamation. The Division does not have site specific information relative to vegetation types at the mine plan area. However, there are nine wildlife habitats present - riparian or wetland types, cliffs and tallus, sagebrush, pinyon-juniper forest, shrubland, aspen forest, ponderosa forest, parkland and spruce-fir forest. The Company should identify each of these habitat associations on appropriately scaled maps.

It is believed that if satisfactory reclamation is achieved and man's disturbance does not continue or become a factor, that most species of wildlife displaced from the mine plan area will return. Without doubt, the key to success for enhancing or restoring wildlands will be development of habitats so that postmining condition as compared to the premining condition will have similar species, frequency and distribution of permanent plants in each vegetative type this will allow for natural plant succession. Additionally, other habitat features that represent the various life requirements for local wildlife must be provided.

Wildlife Use Areas

The enclosed map displays mapable, high value use areas for high interest wildlife on or adjacent to the mine plan area. This display includes stream sections and bodies of water, if any, utilized by high interest fish species. Also displayed are known seeps, springs, wetlands, and riparian zones. Note that there are high interest wildlife distributions that are so broad that they cover the entire map and therefore are not illustrated. However, all vertebrate species of high interest wildlife and their distributions are discussed in the following narrative.

Water

Due to demands of state and federal coal mining regulations, the Company will probably be required to identify and appropriately monitor all surface waters for potential impacts from subsidence. This information should be correlated with the wildlife use area information due to the value of water to wildlife.

FISH AND WILDLIFE INVENTORY

Aquatic Use Areas

Macrophytes

From a position of the aquatic wildlife resource it is believed that there is no practicality for information relative to macrophytes to be addressed by the mine permit application;

such information is not generally available.

Macroinvertebrates

The results from studies of macroinvertebrates may be required for purposes of determining need for stream buffer zones in stream sections supporting biological communities. Since historic impacts from this mine's operation have not significantly impacted Huntington, Deer and Meeting House Creeks data relative to macroinvertebrates as a pollution index or a forage base for fishes or other predators dependent upon the aquatic resource need not be presented.

Note, impact avoidance procedures that would protect the integrity of the aquatic resource need to be included with the mine permit application. Of importance would be facility designs and operational plans that will preclude further impacts on both streams and identification of procedures that will be utilized to keep any form of coal sediments or other pollution from entering Deer Creek and Huntington Creek. Snow removal is a significant contribution of sediment to local riverine systems. Deposition of coal particles in the aquatic system could have a variety of negative impacts on invertebrate and fish populations.

The results from long-term studies of macroninvertebrates in Huntington Creek and Deer Creek could be of value for the Company to demonstrate that impacts from accumulations of coal and other sediments in each creek are not evident.

Studies relative to macroninvertebrates, if desired or needed, must be conducted by a qualified, private consultant.

Fish - Species Occurrence and Use Area

Aquatic habitats adjacent to the mine plan area support three species of game and two species of non-game fish; all of which are protected. Of these fish, four species have been determined to be of high interest to Utah (reference the Division Publication No. 78-16).

The yellowstone cutthroat trout is an introduced species. It annually spawns between early May and mid-July. Most populations are sustained through natural reproduction; hatching is usually completed by mid-July.

The rainbow trout is an exotic species. Within Utah there are several different strains of this species. Generally speaking they spawn from mid-March through June; hatching is normally completed by late June. It is important to note that natural reproduction by this species is almost non-existent, since it is managed as a stocked population. This management scheme has resulted since their catchability is higher than other trout and the life expectancy of hatchery fish is short.

The brown trout is an exotic species. Its spawning period begins as early as mid-October and is normally completed by late December; hatching of eggs begins in the spring and is usually completed by late May. Most populations are sustained through natural reproduction and supplemental plantings of fingerling brown trout.

The spawning period represents a crucial period for maintenance of trout populations; spawning areas are ranked as being of critical value. Such areas are characterized by clean, gravel zones that are at least six inches deep. These zones must also be covered by a minimum of six inch deep water flowing at a velocity of not less than one foot per second. These physical parameters are necessary for optimum spawning success.

Once the cutthroat or rainbow trout have spawned their eggs incubate in the redds approximately 30 to 50 days - water temperatures ranging from 45 to 50 F. Brown trout eggs incubate throughout the winter which lasts approximately 100 to 150 days - water temperatures ranging from 35 to 40 F. During this crucial period water temperature affects the rate of embryonic develop - the warmer the water the more quickly incubation is completed. It is also during this period that ongoing sedimentation can result in suffocation of the eggs. Fluctuations in stream flow also negatively affects incubation; wherever practicable, maintenance of a constant flow of water during the spawning period enhances reproductive success.

The mottled sculpin is a native species. It annually spawns in the spring between February and May. All of their populations are sustained through natural reproduction. The spawning period represents a crucial period for maintenance of sculpin populations; spawning areas (nest) are ranked as being of critical value. Such areas for sculpin are characterized as a nest scooped out beneath a stone or other submerged object. Spawning areas must have clean, gravel or rubble zones. Both the adult fish attend and defend the nest. They are known to spawn in water temperatures ranging from 45 to 48 F.

The reach of Huntington Creek adjacent to the project area (stream section 3) is ranked as being of high-priority to Utah's cold water fishery management program and is a Class 3 fishery. It supports natural reproduction of self-sustaining cutthroat and brown trout populations. Occasionally, fingerling transplants of both of these species supplement the population. The majority of trout in this stream section are hatchery planted, catchable sized rainbow trout. Section 3 of Huntington Creek is also inhabited by mottled sculpin and mountain sucker.

Although there are no fish in Deer or Meeting House Creeks, their flow of water is of great value for reproductive success of spawning trout in the lower reaches of Huntington Creek for which they are tributary waters. Additionally, drift of macroinvertebrates from these streams represent an important contribution of forage to trout and other fishes in Huntington Creek.

If project operations are planned or develop that would alter, destroy or discharge polluting effluent into any perennial waters, appropriate state and federal permits, a mitigation plan and results from high level studies of the salmonid fishery resource, if any, would be required of the Company. Achievement of mitigation would demand detailed studies of stream velocity correlated to flow, representatives of the stream channel profile, gradient, pool-riffle ratio, substrata types identifying percent representation of each type and surface water information required for SMC 779.16.

If modification of flows is anticipated, instream slow requirements must be considered to meet the needs of the existing fisheries, "biological community" and maintenance of existing riparian or wetland zones. Such baseline information would allow for development of mitigation or reclamation plans that would allow for avoidance, lessening or mitigation of impacts to the fishery and maintenance or re-establishment of unique habitat types. This baseline information is not generally available and would necessitate the services of a qualified private consultant and/or contracting Utah's Division of Wildlife Resources since special permits would be required.

It is important to note that no species of fish having relative abundances so low as to have caused them to be federally listed as threatened or endangered inhabit the mine plan or adjacent areas. The endangered humpback chub, bonytail chub and Colorado squawfish inhabit the Green and Colorado Rivers. Additionally, the humpback (razorback) sucker also inhabits those rivers; it is likely that this species will one day be federally listed as threatened. It is not believed that implementation and operation of the Company's project will impact any of these species.

<u>Terrestrial Use Areas</u>

Wildlife Habitat Types

Of the nine wildlife habitat types present on the mine plan area wetlands and riparian habitats are ranked as being of critical value to all wildlife. Such zones are normally associated with drainage bottoms (ephemeral or intermittent), or perennial streams (UMC 700.5), seeps and springs within the upper Sonoran, Transition and Canadian life zones. Cliffs and their associated tallus areas that lie within the upper Sonoran and Transition life zones are ranked as being of high-priority value to all wildlife. When compared to all other wildlife habitats the aforementioned situations are considered to represent unique habitat associations (Table 1).

Riparian and wetland areas are highly productive in terms of herbage produced and use by wildlife as compared to surrounding areas. Experience has shown that as much as 70 percent of a local wildlife population are dependent upon riparian zones. Cliffs and tallus are of special importance to many high interest wildlife. These unique habitat types must be identified in the permit application and protected due to their high value for all wildlife.

Quantitative (acreage) and qualitative (condition, successional stage and trend) data concerning the wildlife habitats in each ecological association should be included as part of the mine permit application. It is important to note that each legal section of land represented by the mine plan and adjacent areas has been ranked as to its value for the total wildlife resource. Sections 21, 22, 27, 28 and 34 of Township 16 South, Range 7 East have been ranked as being of critical value to wildlife. This is also true for Sections 12, 13, 24 and 25 of Township 17 South Range 6 East and Sections 2, 7, 18, 19 and 30 of Township 17 South Range 7 East. Sections 19, 20, 29, 30, 31, 32 and 33 of Township 16 South Range 7 East have been ranked as being of high-priority value to wildlife. This is also true for Section 1 Township 17 South Range 6 East and Sections 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 26, 27, 28 and 29 of Township 17 South Range 7 East. These rankings were developed through an analysis of cumulative values for use areas of selected individual species of high interest wildlife inhabiting each legal section of land (Table 2).

Amphibians - Species Occurrence and Use Areas

Six species of amphibians, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that all of these species inhabit the project area (reference the Division Publication No. 78-16). Only one species of the amphibians inhabiting the project area have been determined to be of high interest to the State of Utah.

The tiger salamander is a yearlong resident animal of the project area. The substantial value use area for the adult form is represented by any moist underground site or any similar habitat such as inside rotten logs, cellars or animal burrows. Such sites can be found within any wildlife habitat extending from the cold desert (upper Sonoran life zones) through the submontane (Transition life zone) and into the montane (Canadian life zone) ecological association. The larva form, often referred to as a mud-puppy, is a gilled animal that must remain in water within the above described ecological associations. It is interesting to note that the larva may fail to transform into an adult, even after their second season, and they can breed in the larva condition.

Once the larva is transformed into the adult form the animal is primarily terrestrial. Salamanders do migrate to water in the spring for breeding and may remain there during much of the summer. Such an intensive use area would be ranked as being of high-priority value to the animal. In September the newly transformed animals leave the water to find suitable places to spend the winter.

The tiger salamander breeds from March through June and is sexually mature after one year. The male deposits a small tent-shaped structure containing a myriad of sperm on the pool bottom. During courtship the female picks up this structure in her cloaca; then the eggs are fertilized internally before or just at the time they are laid. The eggs, singly or in small clusters, adhere to submerged vegetation; after 10 to 12 days they hatch. Obviously, a critical period for maintenance of the population is when breeding salamanders, eggs or their larva are inhabiting a water.

Post-embryonic development of a salamander's larval form progresses at a pace somewhat controlled by water temperature; in some cold waters the larva may not transform into an adult and drying up of a pool may hasten the process.

Migration to or from water usually occurs at night, during or just after a rain storm. When inhabiting terrestrial sites the tiger salamander is most active at night, particularly on rainy nights, from March through September.

Larva, when small feed on aquatic invertebrates and become predacious to the point of cannibalism when they are larger. Food items for adults include insects, earthworms and occasionally small vertebrates.

No amphibians have relative abundances that are so low to have caused the animal to be federally listed as a threatened or endangered species.

Reptiles - Species Occurrence and Use Areas

Eighteen species of reptiles, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that seventeen of these species inhabit the project area (Reference the Division Publication No. 78-16). Only two species of the reptiles inhabiting the project area have been determined to be of high interest to the State of Utah.

The Utah milk snake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the upper Sonoran (cold desert life zone) through the submontane (Transition life zone) and into the montane (Canadian and possibly Hudsonian life zone) ecological associations. Although its use area spans a multitude of habitats, the animal is extremely secretive, mostly nocturnal and is often found inside or under rotten logs, stumps, boards, rocks or within other hiding places. At night they can be found in the open where they hunt for small rodents, lizards and other small snakes. Occasionally, the milk snake may take small birds or birds eggs.

The milk snake may live beyond twenty years and it becomes sexually mature during its third spring season. After mating, which occurs during spring or early summer when they are leaving the den, female milk snakes produce clutches which average seven eggs. The eggs are secreted in a moist, warm environ and then abandoned; incubation lasts 65 to 85 days. The site where an individual snake has deposited its clutch of eggs is of critical value to maintenance of the species.

The Utah mountain kingsnake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the submontane (Transition life zone) into the montane (Canadian and possibly Hudsonian life zones) ecological association. Little is known concerning this animal except that it frequents areas of dense vegetation and that it is often found near water. Its life history and food habits parallel that described for the Utah milksnake.

To date snake dens, which are protected and of critical value to snake populations, have not been identified on or adjacent to the project area. It is important to note that inventory for such has not been attempted. If the Company at some later time discovers a den it should be reported to the Utah Division of Wildlife Resources. If a den(s) is currently known, its location must be included with the permit application.

No reptiles have relative abundances that are so low to have caused the animal to be federally listed as a threatened or endangered species.

Birds - Species Occurrence and Use Areas

Two hundred forty-two species of birds, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that one hundred thirty-six of these species inhabit the project area (Reference the Division Publication No. 78-16). Twenty-five species of the birds inhabiting the project area have been determined to be of high interest to the State of Utah.

Ducks commonly known as waterfowl are not known to utilize the project area, but may on occasion or during different seasons of the year make limited use of the mine plan area. All of these species are of high interest to the State of Utah.

Generally speaking, the riparian and wetland habitats encompassed by the project and adjacent areas provide substantial valued habitats for waterfowl. Each species has different life requirements and makes various uses of the riparian and wetland habitats.

For those waterfowl that nest locally, the period March 15 through July 15 is ranked as being of crucial value to maintenance of the population. Following incubation, which dependent upon the species may vary between 20 and 28 days and extend up until mid-August, the riparian and wetland habitats represent a high-priority brooding area. Additionally, the wetland habitat (large open water areas or dense marshland, none of which exist on the project area) is of high-priority for seclusion and protection of adult waterfowl during their flightless period when they moult. Males may begin the moult in early June and both sexes and the young are capable of flight by mid-August.

The project and adjacent areas provides substantial valued habitat for a multitude of raptors - turkey vulture, bald and golden eagles, four species of falcons (prairie, American and arctic peregrine falcons and American kestrel), five species of hawks (goshawk, sharp-shinned, Cooper's, red-tailed and Swainson's hawks) and seven species of owls (barn, screech, flammulated, great horned, pygmy, long-eared and saw-whet owls). Many of these species are of high federal interest pursuant to 43 CFR, 3461.1 (n-1). All of these species are of high interest to the State of Utah.

Realistically, nesting habitat does not exist on the project or adjacent areas for many of these species. However, if a species were to nest on or adjacent to the project area, it would have a specific crucial period during which the aerie would need protection from disturbance; this period of time lies between February 1 and August 15. Generally speaking, aeries represent a critical valued site and need protection from significant or continual disturbance within a one-half kilometer radius of the nest. This consideration need only be implemented during the period of time that the nest is occupied. Species specific protective stipulations for aeries are available from the Utah Division of Wildlife Resources and the US Fish and Wildlife Service.

The current level of data relative to site specific use of the area by raptors is unsatisfactory. Likely, there are aeries that have not been identified. Many of these species are highly sensitive to man's disturbances. Therefore, it is recommended that intensive surveys be initiated on the mine plan and adjacent areas for determination of locations for raptor aerie territories. Such data needs to be merged with information provided within this report.

Golden eagles are a common yearlong resident of the mine plan area. There are no known active aerie territories associated with the project. (Note, an aerie territory is utilized by one pair of eagles but may contain several nest sites).

It is believed that aerie territories for eagles may exist on the project area. This belief is based upon the fact that suitable nesting habitat is widespread on the mine plan area and throughout the local area. It is important to note that the regularity of golden eagle observations and the fact that their status is common has resulted in documentation of mostly opportunistic observations of aerie territories.

An active golden eagle nest site is extremely sensitive to disturbance within a one-half kilometer radius. This buffer zone is ranked as being of critical value to maintenance of the eagle population when the bird is actually utilizing the aerie; that period of time is normally between April 15 and June 15. The radius for a buffer zone may need to be increased to one kilometer if a disturbance were to originate from above and within direct line of sight to the eagle aerie.

To date there are no known high-priority concentration areas or critical roost trees for golden eagles on the project area. The mine plan and adjacent areas have been ranked as being of substantial value to golden eagles.

The northern bald eagle is an endangered winter resident (November 15 to March 15) of the local area. To date there are no known high-priority concentration areas or critical roost trees for this species on or adjacent to the project. The mine plan area has been ranked as being of substantial value to wintering bald eagles. Note that no bald eagles are known to nest in Utah, however, historic data documents nesting activity by these birds in the State. There is no known historic evidence of the northern bald eagle nesting on the mine plan or adjacent areas.

The American peregrine falcon (relative abundance is endangered) and the prairie falcon (relative abundance is common) are yearlong residents of the mine plan and adjacent areas. Each of these species utilizes cliff nesting sites. To date there are no known aerie sites for cliff nesting falcons on the project area. However, suitable nesting habitat for the prairie falcon is widespread. Suitable nesting habitat for the American peregrine falcon cannot be found on the mine plan and adjacent areas. Since existence on the area by prairie falcons would not be unlikely, the project area has been ranked as being of substantial value to this cliff nesting falcon. However, the project area only is ranked as being of limited value to peregrine falcons.

For each falcon their aerie site while being utilized and a one-half kilometer radius would be ranked as being of critical value to maintenance of their populations. The falcon's period of use at the aerie site spans the spring and early summer period - prairie falcon, April 15 to June 30; peregrine falcon, March 1 to June 30.

The level of data relative to site specific use of the project area by cliff nesting falcons (not including the kestrel) is unsatisfactory and there could be aeries that have not been identified. Therefore, it is recommended that intensive surveys be initiated on the area for determination of locations for cliff falcon aerie sites.

The endangered arctic peregrine falcon is a winter resident (November 15 through March 15) of the local area. This species has not been observed to utilize the environs on or adjacent to the mine plan area, however, its occasional presence would not be unlikely. Therefore, the project area is ranked as being of limited value to this species.

The blue grouse is a yearlong resident of the project area. Adult birds prefer open stands of conifers. During winter the blue grouse feeds exclusively upon needles and buds of douglas fir and spruce trees. Thus, this wildlife habitat (spruce-fir forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February.

Blue grouse annually exhibit what has been termed a reverse vertical migration. That is, during the spring months, they migrate from the high elevation spruce-fir habitat to lower elevation sagebrush, pinion-juniper or shrubland habitats. This movement is caused by a need of the birds to feed on early developing vegetation. Such movement also facilitates successful breeding, nesting and brooding of their young. Then as the year progresses, they move to the higher elevations.

The males are polygamous and will set up and defend territories for booming and breeding activities against other breeding males. Such territories are critical to maintenance of the population during the crucial period of mid-March through mid-June.

After breeding the female develops a nest site which is secreted on the ground; the nest is of critical value to maintenance of the blue grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young blue grouse while being brooded rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to blue grouse. The crucial period extends from hatching into mid-August.

As summer progresses into the fall season the grouse consumes large quantities of berries.

The ruffed grouse is a yearlong resident of the project area. These grouse are usually found in the continum of habitats extending from aspen to shrubland types. But, during winter they often roost in dense stands of conifers. Generally speaking ruffed grouse prefer habitats lying with 0.25 mile of a stream course; such areas are ranked as being of high-priority value to their population. During winter the ruffed grouse feeds exclusively upon staminate aspen buds. Thus, this wildlife habitat (aspen forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February. During the remainder of the year their diet shifts to include a wide variety of plant and insect material.

Ruffed grouse do not exhibit any type of seasonal migration.

The males are polygamous and will set up and defend territories against other breeding males. The focal point for breeding activity is the drumming log; all such logs are ranked as being of critical value to grouse since they represent sites of historical use. Such territories are critical to maintenance of the population during the crucial period of early March through May.

After breeding the female develops a nest site which is secreted on the ground and deep within an aspen grove; the nest is of critical value to maintenance of the ruffed grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young ruffed grouse while being brooded rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to ruffed grouse. The crucial period for brooding extends from hatching into mid-August.

The band-tailed pigeon is a summer resident of the project area. This bird is seldom observed to utilize the Wasatch Plateau, but when observed the species is only represented by a single bird, pairs or even less frequently a small flock. Since the band-tailed pigeon's use of the Wasatch Plateau is best described as "occasional", the environs associated with the project are only ranked as being of limited value to the bird. Nesting birds secret their nest in trees within the spruce-fir wildlife habitat. Peak on-nest activity occurs in late July and early August.

Mourning doves normally inhabit the project and adjacent areas, which represents a substantial valued use area for these birds, between May 1 and September 15 each year. They nest throughout most of this period and each pair produces two clutches. The pinion-juniper and riparian habitats are ranked as being of high-priority value for nesting. Locally, mourning doves show two peaks in on-nest activity - early July and early August. Successful nesting activities and any water sources are critical to maintenance of the mourning dove population.

The yellow-billed cuckoo is a summer resident of the project area. This bird only nests in the riparian wildlife habitat, therefore, such areas are of critical value to maintenance of this species. Little is known concerning the yellow-billed cuckoo. Its nest is represented by a frail, saucer shaped structure of twigs and is always placed in bush or tree.

The black swift is a summer resident of the Wasatch Plateau. The montane ecological association represents the swift's substantial valued use area. Normally, the bird is associated with a small flock that represents a colony. Black swifts are usually observed soaring as pairs and they feed upon flying insects. A colony's nests are scattered along precipitous terrain where the nest is often secreted behind a waterfall. Such a moist habitat is not known to exist on the project area. Cliff and tallus wildlife habitats are ranked as being of high-priority value to the black swift. There is evidence that pair bonds are long lasting and that a nest may be utilized in successive years.

The belted kingfisher is a yearlong resident of the project area. It is found only along riverine systems and its substantial value use area extends from the cold desert through the submontane and into the montane ecological associations. Therefore, the riparian wildlife habitat represents a high-priority valued use area for this bird. It feeds exclusively upon fish. The kingfisher's nest is always secreted within a burrow along stream banks, thus, dirt bank habitats along riparian areas are of critical value to the bird.

The pileated woodpecker is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). The spruce-fir and aspen wildlife habitats of the montane ecological association represent this birds substantial valued use area. It is important to note that the pileated woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a yearlong resident with a relative abundance considered to be rare.

The Williamson's sapsucker is another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Typically, the substantial valued use area for this species is the spruce-fir habitat of the Hudsonian life zone in the montane ecological association. Therefore, the spruce-fir habitat of the Canadian life zone on the project site would only represent the substantial valued use area for the yellow-bellied sapsucker. The yellow-bellied sapsucker is a yearlong resident of the environs associated with the project area and it has a relative abundance considered to be common. Where as the Williamson's sapsucker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the Williamson's sapsucker is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

The Lewis woodpecker is also another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is represented by riparian habitats characterized by cottonwood stands and ponderosa forests. These habitats do not exist on the project site. It is important to note that the Lewis woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a summer resident or only a transient. Its relative abundance is unknown.

The purple martin is a summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. In Utah its substantial valued use area is represented by open spruce-fir, aspen or ponderosa forest habitats of the montane ecological association. The purple martin feeds on flying insects and may secret its nest within any suitable above-ground cavity.

hibernate and remain over winter.

The western big-eared bat is a yearlong resident of the biogeographic area that surrounds the project site. This animal roosts and hibernates within caves, mine tunnels or suitable buildings located in the pinion-juniper, shrubland and low elevation spruce-fir habitats of the submontane and montane (Canadian life zone) ecological association. Such areas represent this bats substantial valued use area.

The snowshoe hare is a yearlong resident of the biogeographic area that surrounds the project site. Its relative abundance has been determined to be limited, since its substantial valued use area is restricted to the spruce-fir and nearby aspen and riparian habitats of the montane (Canadian and Hudsonian life zones) ecological association. Such areas are ranked as being of high-priority value to the animal during its breeding season which spans the period between early April and mid-August.

The cottontail rabbit (mountain cottontail inhabits sites lying between 7,000 and 9,000 feet in elevation and the desert cottontail inhabits sites lower than 7,000 feet in elevation) is a yearlong resident of the biogeographic area that surrounds the project site. The entire project area represents a substantial valued use area for cottontails. Their young are born between April and July. This is a crucial period for maintenance for the cottontail population.

The northern flying squirrel is a yearlong resident of the biogeographic area that surrounds the project site. Currently, its relative abundance is unknown. Its substantial valued use area is restricted to spruce-fir or other mixed conifer habitats of the montane (Canadian and Hudsonian life zones) ecological association. This species is the only nocturnal squirrel in Utah. The flying squirrel may build its nest within an old woodpecker hole or it may build an outside nest of leaves, twigs and bark. Mating occurs twice in each year-February through March and June through July. Afterwhich, two to six young are born after a gestation period of 40 days - April through May and August through September. These periods are of crucial value to maintenance of their populations. During winter flying squirrels are gregarious; 20 or more have been known to den together.

Beaver are yearlong inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is restricted to riparian and adjacent aspen habitats (those located within 100 meters of the riparian zone) in the cold desert, submontane and montane (Canadian life zone) ecological associations. These animals construct a conical shaped lodge in which a family group lives throughout the year. The lodge is of critical value to maintenance of the beaver population. One litter of kits is produced each year; they are born between late April and early July after a gestation period of 128 days. Kits and yearlings coinhabit the lodge with the adult pair. When they attain 2 years of age they are forced to leave; females can breed at 2.5 years of age. Due to the animals dependency upon flowing water and the associated riparian vegetation, the riparian wildlife habitat is ranked as being of critical value to beaver populations.

The red fox is a yearlong inhabitant of the biogeographic area that surrounds the project site. The substantial valued use area for the red fox would include all wildlife habitats extending from the cold desert through the montane (Canadian life zone) ecological associations. Almost nothing is known of their population dynamics. Without doubt a crucial period for this specie is when they are caring for young in the den. Dens while being inhabited are a critical use area.

The gray wolf is a historic inhabitant of the biogeographic area that surrounds the project site. Currently its relative abundance is so low that the animal is listed as endangered with extinction. The wolf's substantial valued use area would be represented by any remote habitat in any ecological association.

Black bears are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is represented by all natural wildlife habitats (excluding the pasture and fields and urban or parks types) extending from the submontane into the montane (Canadian and Hudsonian life zones) ecological associations. These animals go into semi-hibernation during winter. During this crucial period, which may last from December through March, the animal secrets itself in a den in order to conserve body energy reserves. The young are born in the den during January or February. Dens while being inhabited represent a critical valued use area for bears.

Many of the members of the family mustelidae are known to inhabit the biogeographic area that surrounds the project site. They are all protected and classified as furbearers - short-tailed and long-tailed weasels, mink, wolverine, marten, badger, striped and spotted skunks. Additionally, raccoon and muskrat, although not furbears, are also inhabitants of the biogeographic area that surrounds the project site. All of these species are of high interest due to their value in the fur market.

The substantial valued use area for short-tailed and long-tailed weasels, mink, muskrat and raccoons is the riparian habitat. Weasels, which are inhabitants of the project site, do make some use of other habitats that are proximal to riparian zones. Muskrats and raccoons are restricted to riparian habitats of the cold desert and submontane ecological association; thus, they are not found on the project area. The long-tailed weasel can be found from the cold desert up into the montane (Canadian and Hudsonian life zones) ecological associations. The short-tailed weasel and mink populations extend their use from the submontane into the montane ecological association. It is important to note that the weasel is restricted to the Canadian life zone; where as the mink utilize the Canadian and Hudsonian life zones.

The substantial valued use area for marten and wolverine is the montane ecological association. The marten does not utilize the Alpine life zone but the wolverine can be found at the elevation. Both species could be found in the environs of the project site.

The substantial valued use area for badger and skunks span all wildlife habitats other than dense forests in the cold desert, submontane and montane (Canadian life zone) ecological associations. Skunks show some afinity for habitats proximal to water. Skunks and badgers are dependent upon a suitable prey source.

A crucial period for maintenance of all furbearers, raccoons, and muskrat populations is when they have young in a nest, den or lodge. Such sites are critical for reproductive success.

Bobcat, Canada lynx and cougar are known to inhabit the biogeographic area that surrounds the project site. For all of these species a crucial period for maintenance of their population is when the female has her young secreted at a den site. Such sites are of critical value when being utilized. It is also crucial to their survival that a female accompanied by young not be killed or harassed.

The substantial valued sue area for bobcats extends from the cold desert through the submontane and into the montane (Canadian life zone) ecological association. The bobcat is normally associated with precipitous terrain, but has been observed in every wildlife habitat within the aforementioned ecological associations. Their primary prey source is represented by small mammals and birds or any other small animal they can catch. It is important to note that bobcats occasionally do kill the young of big game animals.

The substantial valued use area for the Canada lynx is restricted to the Canadian and Hudsonian life zones of the montane ecological association. Normally, this cat would only be expected to utilize riparian and forested wildlife habitats. The lynx is similar in predation habits to the bobcat.

The substantial valued use area for the cougar (locally known as mountain lion) extends from the submontane into the montane (Canadian and Hudsonian life zone) ecological association. Due to the dependency of the cougar upon mule deer as a prey source, a ranking of the lion's seasonal distribution parallels that of the deer.

Mule deer are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the cold desert through the submontane and montane ecological associations. In some situations deer show altitudinal migrations in response to winter conditions. There are, however, habitats where deer reside on a yearlong basis (see attached map).

Migration of mule deer from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting season coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the deer's urge to migrate and continue adverse weather keeps the deer on the winter range.

A portion of the project site represents winter range for mule deer herd Unit 34. Winter ranges for mule deer are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions the higher elevation portion of the winter range becomes unavailable to deer due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the deer; these sites are ranked as being of critical value. It is important to note that all of the canyon bottoms associated with the project are of critical value to deer. Critical valued sites must be protected from man's disturbance when the deer are physically present on the range.

Deer begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area represent deer herd Unit 34. They are ranked as being of high-priority value to mule deer. In instances where extent of summer range is the major limiting factor for a deer herd, those summer ranges are ranked as being of critical value.

There are ranges that support mule deer on a yearlong basis. Most of these ranges are limited value to deer. However, there are some areas supporting yearlong use that are ranked as being of high-priority value to deer. There are no yearlong ranges for mule deer on the project site.

Mule deer fawn during the month of June. The continum of wildlife habitats extending from the pinion-juniper through the shrubland and into the aspen type probably represents the fawning area. All riparian areas are of critical value for fawning and maintenance of the deer population. To date no specific areas showing annual use for fawning are known. It is probable that such areas exist; they would be ranked as being of critical value to deer. It is important to note that June represents a crucial period for maintenance of deer populations.

Agriculture areas that are bisected by the access route to the project area are utilized yearlong by mule deer. Their use is sometimes intensified during the winter and spring periods.

Moose are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats in the montane ecological association except those associated with the Alpine life zone. In some situations moose show altitudinal migrations in response to winter conditions. There are, however, habitats where moose reside on a yearlong basis (see attached map).

Migration of moose from summer range to winter range is initiated during late November; probably, changing weather conditions is the initial stimulus. The onset of winter weather reinforces the moose's urge to migrate and continued adverse weather keeps the animal on the winter range.

A portion of the project site represents winter range for the Southeastern Utah moose herd - Huntington drainages. Winter ranges for moose that are characterized as riparian habitats are ranked as being of critical value, where as the remainder of the winter ranges are ranked as being of high-priority value to the animal. Note that all riparian areas associated with the project have shown use by moose. Winter ranges are usually inhabited by moose between December 1 and May 15 each year. During winters with severe conditions the higher elevation portion of the winter range becomes unavailable to moose due to snow depth. Critical valued sites must be protected from man's disturbance when the moose are physically present on the range.

Moose begin their migration back to summer range during mid-May and remain there throughout November. Summer ranges on the project area support animals from the Huntington drainages of the Southeastern Utah moose herd. Those summer ranges are ranked as being of high-priority value.

Ranges that support moose on a yearlong basis are ranked as being of critical value.

Moose calf during late May and June. Calving takes place in the riparian or adjacent forest habitats. Without doubt, all riparian areas are of critical value for calving and maintenance of the moose population. To date no specific areas showing annual use for calving are known. It is probable that such areas exist; they would be ranked as being of critical value to moose. It is important to note that June represents a crucial period for maintenance of moose populations.

Rocky mountain elk are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the submontane through the montane ecological association. Elk do not show as strong of altitudinal migration as mule deer do in response to winter conditions, but they do migrate to wintering areas (see attached map).

Migration of elk from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting seasons coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the elk's urge to migrate and continued adverse weather keeps elk on the winter range.

A portion of the project site represents winter range for the Manti elk herd - Unit 12. Winter ranges for elk are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions some portions of the winter range becomes unavailable to elk due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the elk; these sites are ranked as being of critical value. The high ridges associated with the project are critical winter ranges for elk. Critical valued sites must be protected from man's disturbance when the elk are physically present on the range.

Elk begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area support the Manti elk herd - Unit 12; they are ranked as being of high-priority value.

Elk calf during the month of June. Their preferred calving areas are best described as aspen forests with lush understory vegetation. All riparian areas on the summer range are of critical value for calving and maintenance of the elk population. To date no specific areas showing annual use for calving are known. It is probable that such areas exist; they would be ranked as being of critical value to elk. It is important to note that June represents a crucial period for maintenance of elk populations.

Currently, there are no other known high interest wildlife species or their habitat use areas on or adjacent to the project area. It is not unreasonable to suspect that in the future, some additional species of wildlife may become of high interest to the local area, Utah or the Nation. If such is the case, the required periodic updates of project permits and reclamation plans can be adjusted and appropriate recommendations made.

Table Ranking of value per ecological association for wildlife habitats of vertebrate species having high interest to the state of Utah. Crucial-critical (C) habitats are the highest valued followed in respective order by high-priority (H), substantial value (S) and limited valued (L) habitats.

Ecological Association	Riparian and Wetland	Desert Scrub	Pasture and Fields	Urban or Parks	Cliffs and Tallus	Sagebrush	P-J Forest	Shrubland	Aspen Forest	Ponderosa Forest	Parkland	Spruce-fir Forest
	LOWER SONORAN LIFE ZONE											
Warm Desert	This ecological association does not exist in the Southeastern Region											
	UPPER SONORAN LIFE ZONE											
Cold Desert	C(H^1, S^2)	S	S	S	H							
	TRANSITION LIFE ZONE											
Submontane	C(H^1, S^2)		S	S	H	S	S	S				
	CANADIAN LIFE ZONE											
Montane	C(H^1L^2)		S	L	S				S	S	S	S
	HUDSONIAN LIFE ZONE											
Montane	H(S^1; L^2)				S							S
	ALPINE LIFE ZONE											
Montane	This ecological association does not exist in the Southeastern Region											

1. Habitat ranking value for species associated with the riparian-wetland type that represents just the wet meadow situation.
2. Habitat ranking value for species associated with the riparian-wetland type that represents just the dirt bank situation.

Table 2. Ranking of wildlife value per legal section of land on coal producing lands in Utah. Crucial-critical (1), sections are the highest valued followed in respective order by high-priority (2), substantial value (3) and limited valued (4) sections.

BOOK CLIFFS

T.	R.	Section	Rank
12	8	1-36	1
12	9	2,4-12,14,16-18,31-35	1
		1,3,13,15,19-30,36	2
12	10	2-11,13-17,19-27	1
		1,12,18,28-36	2
12	11	16-28,33-35	1
		1-15,29-32,36	2
12	12	19,27-30,32-34	1
		1-18,20-26,31,35,36	2
13	8	1-3,5-16,19,20,22-24,28-31	1
		4,17,18,21,25-27,32-36	2
13	9	1-11,14,15,17,18,28,29,31-35	1
		12,13,16,19-27,30,36	2
13	10	1,2,6	1
		3-5,7-36	2
13	11	14-16,21-28,34-36	1
		1-13,17-20,29-33	2
13	12	4,19,30,31,[illegible]	1
		1-3,5-18,20-29,32-35	2
13	13	1-36	2
14	13	1-36	2
14	14	33	1
		1-32,34-36	2
15	14	1-21,23-26,28-36	2
		22,27	3
16	14	24-26,35,36	1
		1-23,27-34	2
16	15	3,10,11,14,23-25,29-33	1
		1,2,4-9,12,13,15-22,26-28,34-36	2
17	14	1,12,13,24,25,36	1
		2,3,10,11,14,15,22,23,26,27,34, 35	2
17	15	4-9,16-22,27-34	1
		1-3,10-15,23-26,35,36	2
18	14	1,27	1
		2,3,10-15,22-26,34-36	2
19	15	4-10,15-18	1
		1-2,11-14,19,21-25,30-32	2
		3,20,26-29,33-36	3

HENRY MOUNTAINS

T.	R.	Section	Rank
27	9	1-36	1
30	9	25,32-36	3
		19-24,26-31	4
30	10	20-29,32-36	1
		19,30,31	3
31	8	1,7,12,13,18,19,24,25,30,31,36	3
		2-6,8-11,14-17,20-23,26-29,32-35	4
31	9	4-9,16-21,28-33	3
32	8	30,31	2
		1,6,7,10-15,18,20-29,33-36	3
		2-5,8,9,16,17,19,32	4
32	9	1,12,13,24,25,35,36	1
		2-11,14-23,26-34	3
33	8	6-8,12-14,17-20,22-36	2
		1-4,9-11,15,16	3
		5,21	4
33	9	1-3,9-17,20-28,34-36	1
		7,18,19,29-32	2
		4-6,8,33	3
34	8	1-3,10-13,15	2
		14	3
34	9	3	1
		2,5-11,13,14,16-19	2
		1,4,12,15,20-24,26-28	3
		25,29-36	4
34	10	1-23,26-30,32-34,36	2
		24,25,35	3
		31	4

KAIPAROWITS PLATEAU

T.	R.	Section	Rank
[illegible]	1	26,27,34-36	1
		25,33	2
		19-25,29-32	3
		28,31-33	1
		19-21,29-33	3
	1	1-3,10-14,24	1
		4-9,15-23,25-36	2
34	2	4-7,17,18,20,21,28,29	1
		8,9,16,19,30-33	2
35	2W	3-10,16-19	1
		2,11,14,15,20-23,27-32	2
		1,12,13,24-26,33-36	3

KAIPAROWITS PLATEAU (CONTINUED)

T.	R.	Section	Rank
35	1	1-34	2
		35-36	3
35	2	4-9,16-20,25	2
		21-24,26-36	3
35	3	30-32	2
		19-29,33-36	3
36	3W	1-3,10-12,14,15	2
		13	4
36	2W	1-6,8-12	3
		7,13-18,22-27,34-36	4
36	1W	36	1
		1,24-26,35	2
		2-23,27-34	3
36	1	4-9,19-36	2
		1-3,10-18	3
36	2	30,31	2
		1-29,32-36	3
36	3	5,8,17,20,21,27,28,33-35	2
		1-4,6,7,9-16,18,19,22-26,29-32, 36	3
37	1W	1,2,11-14,23-26,35,36	2
		3-10,15-22,27-34	3
37	1	1-36	2
37	2	6,7,12,13,17-20,24,25,29-32,36	2
		1-5,8-11,14-16,21-23,26-28, 33-35	3
37	3	1,2,6-9,12,15-23,25-36	2
		3-5,10,11,13,14,24	3
37	4	20,21,28-33	2
		19	3
38	1W	1-3,11-14	2
		4-10,15-18	3
38	1	1-18,22-27,34-36	2
38	2	17	1
		1,4-9,12,13,16,18-21,24,25,28-33, 36	2
		2,3,10,11,14,15,22,23,26,27,34, 35	3
38	3	1-36	2
38	4	2-36	2
		1	4
38	5	19-22,26-36	2
		23-25	4
39	1	1-18,22-27,34-36	2
39	2	1,2,4-9,11-20,22-36	2
		3,10,21	3
39	3	1-36	2
39	4	1-36	2
39	5	1-36	2
40	2	1-36	2
40	3	1-36	2
40	4	1-36	2
40	5	1-36	2
40	6	4-9,16-21,28-33	2
41	2	1-30	2
		31-36	3
41	3	31-36	1
		1-21,29,30	2
		22-28	3
41	4	31-36	1
		1-17,20-28	2
		18,19,29,30	3
41	5	31-33	1
		1-9,11-14,18,23-26,35,36	2
		10,15-17,19-22,27-30,34	4
42	1W	13-36	1
		4,9	2
		1-3,5-8,10-12	4
42	3	1-36	1
42	4	1-36	1
42	5	2-36	1
		1	2
43	3	1-11,14-18	1
		12,13	4

WASATCH PLATEAU NORTH

T.	R.	Section	Rank
12	6	1-26,29,31,34-36	1
		27,28,30,32,33	2
12	7	1-15,17-36	1
		16	3
12	8	1-36	1
13	6	1,2,5-8,10,13,17-20	1
		3,4,9,11,12,14-16,21-36	2
13	7	1-4,9-17,19,22-26,31,32,35,36	1
		5-8,18,20,21,27-30,33,34	2
13	8	1-3,5-16,19,20,22-24,26-31	1
		4,17,18,21,[illegible]	[illegible]

WASATCH PLATEAU NORTH (CONTINUED)

T.	R.	Section	Rank
14	6	28-33	[illegible]
		1-27,34-36	[illegible]
14	7	1,4-6,9,12,13,16	[illegible]
		2,3,7,8,10,11,14,15,17-36	[illegible]
15	6	4-6,10-15,22-24	[illegible]
		1-3,7-9,16-21,25-36	[illegible]
15	7	32-36	[illegible]
		1-31	[illegible]
15	8	9,15,20-22,27-29,32,33	[illegible]
		1-8,10-14,16-19,23-26,30,31,34-36	[illegible]
16	6	11,13,14,16,20-26,28,29,31-33,35, 36	[illegible]
		1-10,12,15,17-19,27,30,34	[illegible]
16	7	1-5,9-16,21-28,34-36	[illegible]
		6-8,17-20,29-33	[illegible]
16	8	4,7,9,17-21,26-31	[illegible]
		1-3,5,6,8,10-16,22-27,32-36	[illegible]
17	6	4-9,11-14,16-22,24-35	[illegible]
		1-3,10,15,23,36	[illegible]
17	7	1,2,7,12,18,19,25,30	[illegible]
		3-6,8-11,13-17,20-24,26-29,31-36	[illegible]
17	8	5,6,16,19	[illegible]
		4,7-9,17,18,20,21,28-33	[illegible]
18	6	1-3,10,11,13-15,22-27,34-36	[illegible]
		12	[illegible]
18	7	4,5,7-11,13-17,19-27,29-32,34-36	[illegible]
		1-3,6,12,18,28,33	[illegible]
19	6	1-3,10-15,22-27,34-36	[illegible]
19	7	1-3,5,23,27-34	[illegible]
		4,24-26,35,36	[illegible]

WASATCH PLATEAU SOUTH

T.	R.	Section	Rank
20	5	20-29,31-36	[illegible]
		19,30	[illegible]
20	6	19-36	[illegible]
21	4	1-3,10-15,19-36	[illegible]
		4-9,16-18	[illegible]
21	5	1-36	[illegible]
21	6	4-9,16-21,28-33	[illegible]
22	3	1-3,10-15,22-27,34-36	[illegible]
22	4	1-4,9-16,21-28,33-36	[illegible]
		5-8,17-20,29-32	[illegible]
22	5	1-20,22-24,29-30	[illegible]
		21,25-28,31-36	[illegible]
23	3	1,12,13	
		2,3,10,11,14,15,22-27	
		34-36	
23	4	2-4,6-11,14-18,20-29,31-36	
		1,5,12,13,19,30	
24	4	2,4-9,16-18	
		1,3,10-15	

Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking: Substantial-Value	High-Priority[2]	Crucial-Critical[2]
		Aquatic Use Areas	
Stream Sections and Lakes[1]	[s-cw-2-4-yl]	[h-cw-2-3-yl]	[c-cw-2-1-yl]
		Terrestrial Use Areas	
Wetlands, Riparian Zones, Seeps and Springs			
Bison	Herd Distribution s-b-yl		Winter Range c-b-wt 12-1 to 4-15 Summer Range c-b-su 4-15 to 11-30

[1] Streams: The first letter (c) identifies one of the four use areas ranking--c, crucial-critical; h, high-priority; s, substantial value; l, limited value. The second group of letters (cw) identifies the primary type of fishery for which a water is managed--cw, cold water fishery; ww, warm water fishery; ng, non-game fishery. The first number (2) identifies the stream section. The second number (3) identifies one of the six stream classes defined by Utah Division of Wildlife Resources for Utah's State Water Plan. The last letters (yl) identify a need for a yearlong protection of this water.

[1] Lakes: Notations are the same as stream sections except the numeral that identified stream section has been replaced with the name of the body of water.

Game fish species that inhabit the stream sections or lakes are identified on the map overlays.

[2] The dates given for various use areas or activities of terrestrial wildlife identify when a species is normally present or participating in an activity and also denotes the period when protection from disturbance is needed.

Figures 1. Continued

Wildlife Use Areas	Use Area Ranking: Substantial-Value	High-Priority[2]	Crucial-Critical[2]
Bighorn Sheep Desert (dbs) Rocky Mountain(mbs)	Herd Distribution s-dbs-yl s-dbs-yl	Tallus Slopes (ewes and lambs) h-dbs-yl 1-1 to 12-31	Rutting Season (tallus slopes) c-dbs-rt 11-1 to 12-31
		Mesa Tops-- 1 mile radius (rams) h-dbs-yl 1-1 to 10-31	Lambing Season (tallus slopes) c-dbs-la 5-1 to 6-15
Black Bear	Population Distribution s-bb-yl		
Cougar	Population Distribution s-c-yl		
Elk	Herd Distribution s-c-yl	Winter Range h-e-wt 11-1 to 5-15	Winter Range c-e-wt 11-1 to 5-15
		Summer Range h-e-su 5-16 to 10-31	
Mountain Goat	Herd Distribution s-mg-yl		
Moose	Herd Distribution s-m-yl		Yearlong c-m-yl 1-1 to 12-31
Mule Deer	Herd Unit s-d-yl	Winter Range h-d-wt 11-1 to 5-15	Winter Range c-d-wt 11-1 to 5-15
		Summer Range h-d-su 5-16 to 10-31	Summer Range c-d-su 5-16 to 10-31
Pronghorn Antelope	Herd Distribution s-pa-yl	Yearlong Range h-pa-yl 1-1 to 12-31	Winter Season c-pa-wt severe snow conditions
			Fawning Season c-pa-fa 5-12 to 6-20

Figure 1. Continued

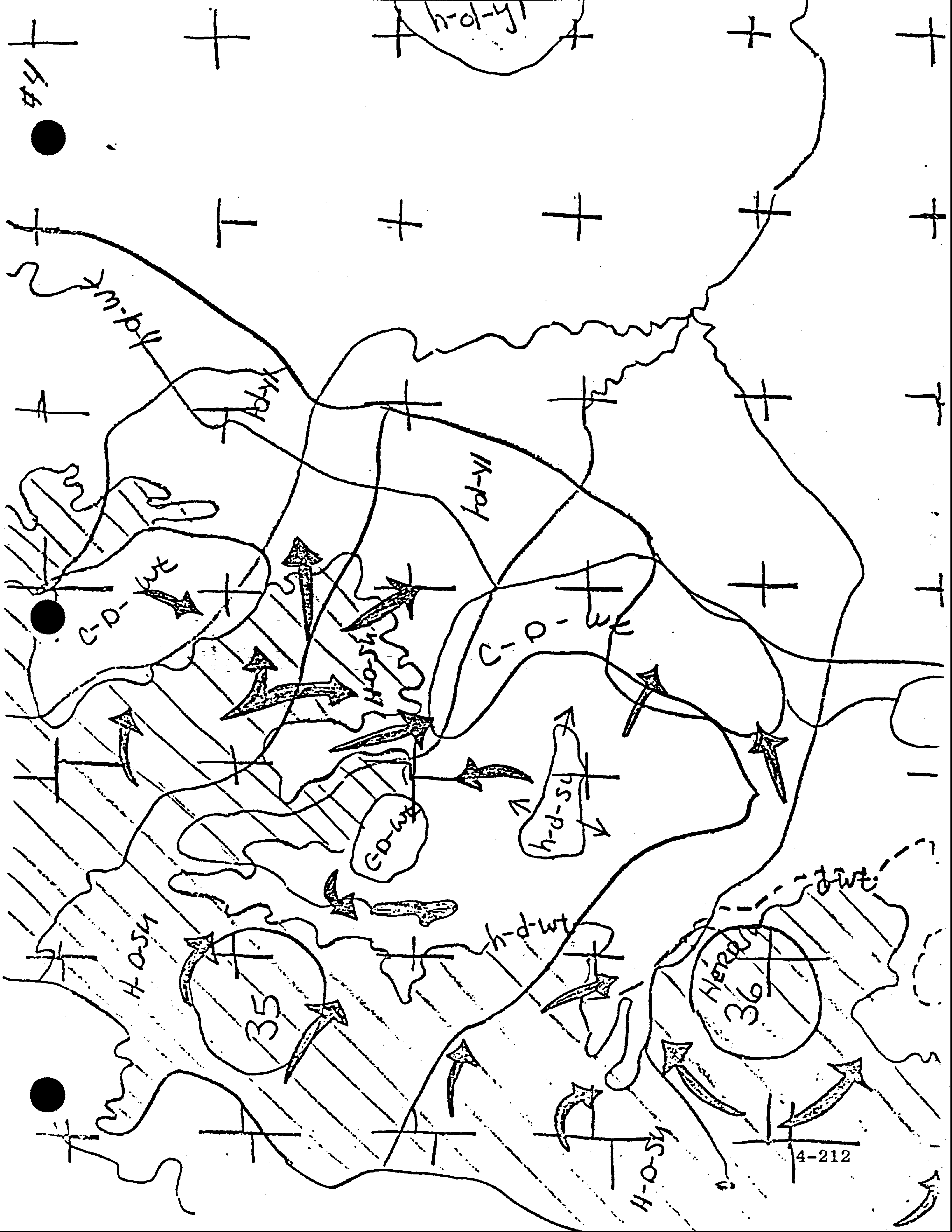
Wildlife Use Areas	Use Area Ranking		
	Substantial Value	High-Priority[2]	Crucial-Critical[2]
		Terrestrial Use Areas	
Gambel Quail	Population Distribution s-gq-yl		Riparian Zones c-gq-yl 1-1 to 12-31 Nesting Season c-gq-n 4-15 to 5-30
Merriams Turkey	Population Distribution s-mt-yl	Winter Range h-mt-wt 12-1 to 3-31 Summer Range h-mt-su 6-1 to 11-30	Display and Nesting Area c-mt-n 4-1 to 5-30 Roost Trees (0.5 mile radius buffer zone) c-mt-rt 1-1 to 12-31
Mourning Dove	Population Distribution s-du-su		Nesting Season c-du-n 5-1 to 8-31
Pheasant Ring-necked White-winted	Population Distribution s-rnp-yl s-wp-yl		Croplands and Adjacent Riparian and Wetlands c-rnp or wp-yl 1-1 to 12-31 Nesting Season c-rnp or wp-n 5-15 to 7-15
Ruffed Grouse	Population Distribution s-rg-yl	Summer Range (0.25 miles each side of stream courses) h-rg-su 3-11 to 11-30	Brooding Areas (0.25 miles each side of stream courses) c-rg-b 6-1 to 8-15 Winter Range (clone of mature male Aspen near stream) c-rg-wt 12-1 to 2-28

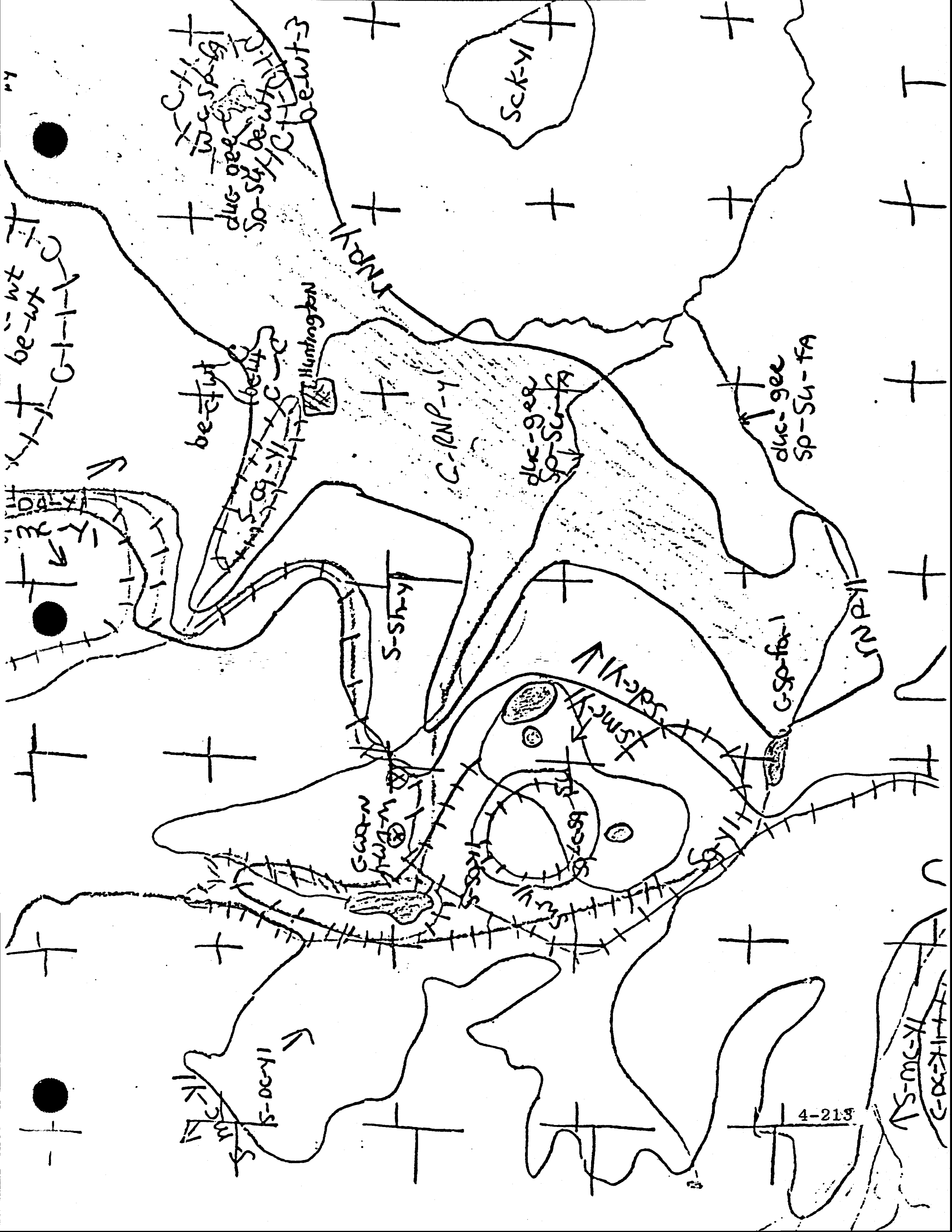
Figure 1. Continued

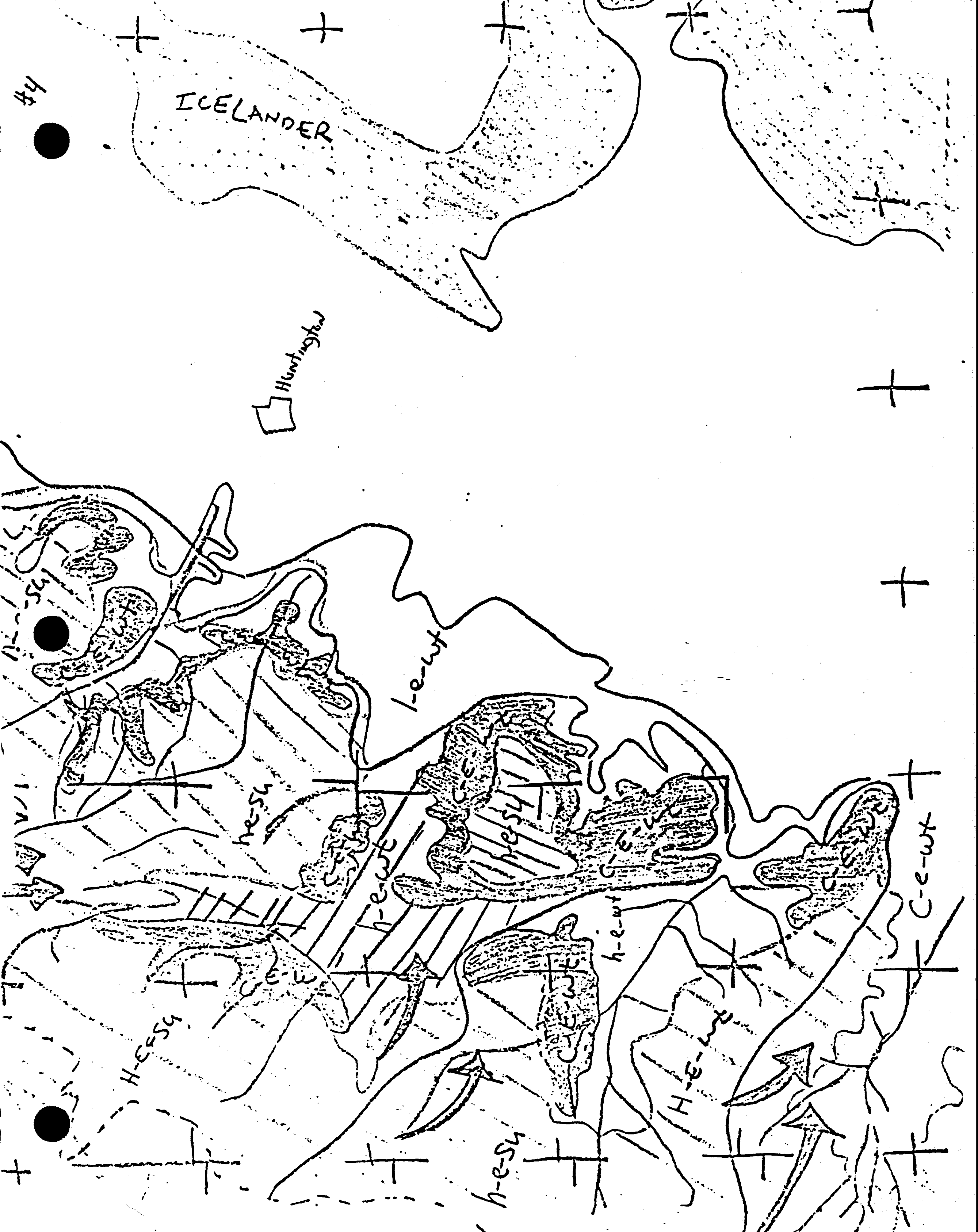
Wildlife Use Areas	Use Area Ranking: Substantial Value	High-Priority[2]	Crucial-Critical[2]
		Terrestrial Use Areas	
Sage Grouse	Population Distribution s-sa-yl	Summer Range s-sa-su 8-16 to 11-14	Strutting Grounds and associated brooding area c-sa-st,b 3-15 to 8-15 Winter Range c-sa-wt 11-15 to 3-14
Snowshoe Hare	Population Distribution s-sh-yl		Nesting Season (spruce-fir and lodgepole pine forests) c-sh-n 4-1 to 8-15
Waterfowl	Population Distribution (all wetlands, stream courses, ponds and lakes) s-wa-yl	Peak Migration (all wetlands, stream courses, ponds and lakes) h-wa-m 3-15 to 5-15 (spring) 8-15 to 10-15 (fall) Brooding and Mounting Season (all wetlands, stream courses, ponds and lakes) h-wa-bm 7-16 to 8-15	Nesting Season c-wa-n 3-15 to 7-15

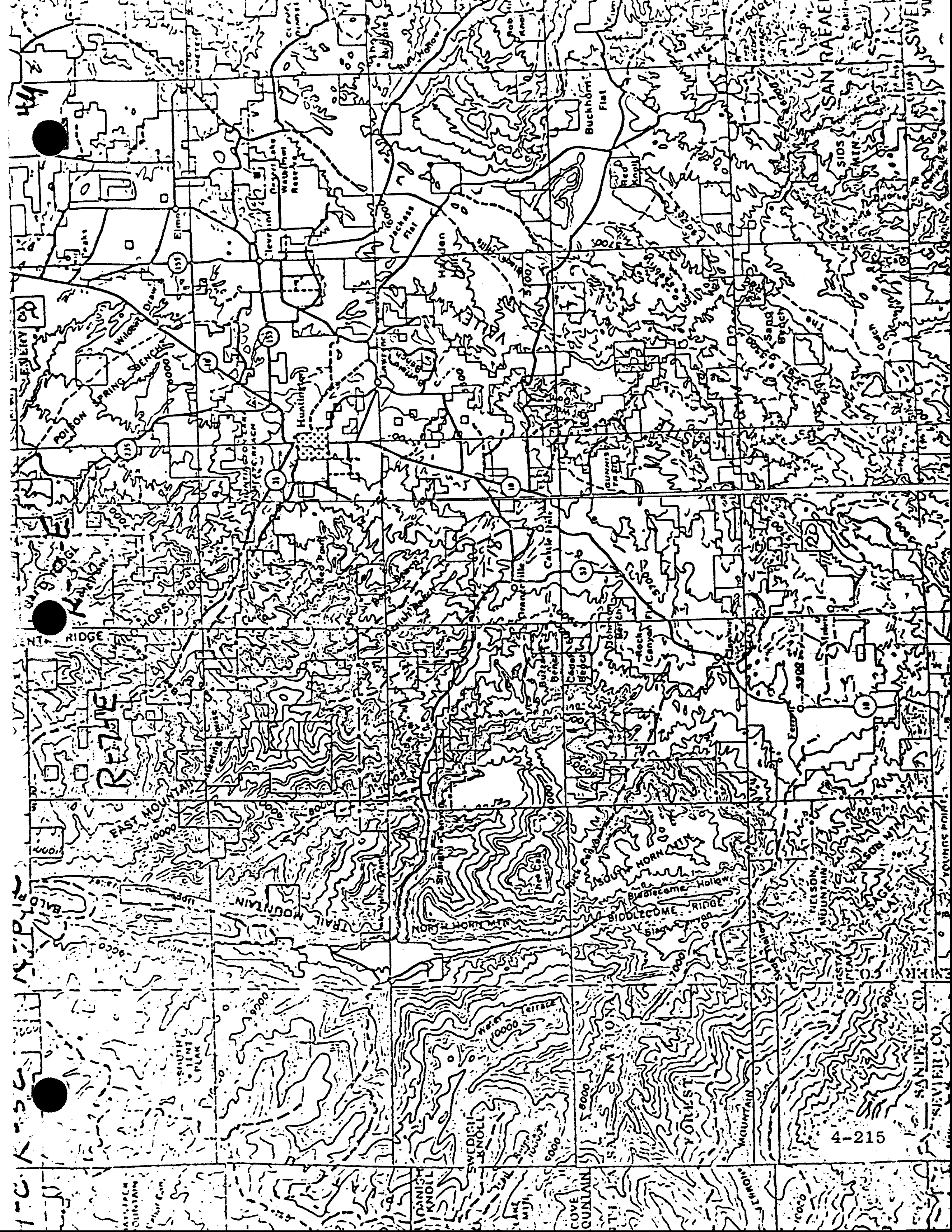
Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority[2]	Crucial-Critical[2]
		Terrestrial Use Areas	
Vultures, Accipiters, Buteos (Hawks only), Herriers, Osprey, Merlin, American Kestrel and Owls	Population Distribution (The entire area provides habitat use areas for several species.)	Breeding Territory Surrounds an aerie site	Aerie Site Species specific symbols identified on map-protection needed in 0.25 mile radius buffer zone when in use.
Golden Eagle (common year-around resident)	Population Distribution (The entire area provides habitat use areas for this species.)		Aerie Site ⊗ 2-15 to 6-15
Bald Eagles	Winter Distribution (Entire area between 11-15 and 3-15 each year)	Winter Concentration h-be-wt 11-15 to 3-15	Roost Tree 11-15 to 3-15
Cliff Nesting Falcon			Aerie Site ⊗ 3-1 to 6-30


#4
h-d-yl
h-d-wt
h-d-yl
h-d-yl
c-o-wt
h-o-sy
c-o-wt
c-o-wt
h-d-sy
h-d-wt
h-o-sy
35
Herd
36
d-wt
h-o-sy
4-212


Sck-yl
Huntington
C-RNP-y
dwc-gee
sp-su-fA
S-sh-yl


#4
ICELANDER
Huntington
l-e-wt
h-e-sy
c-e-wt
h-e-wt
c-e-w
H-e-sy
H-e-wt
C-e-wt



Buckhorn Flat
Jackass Flat
Elmo
Cleveland
Huntington
POISON SPRING BENCH
EAST MOUNTAIN
TRAIL MOUNTAIN
NORTH HORN MTN
SOUTH HORN MTN
BIDDLECOME RIDGE
Biddlecome Hollow
Cattle Flat
Ferron
SAN RAFAEL
SIDS MTN
SWEDISH KNOLL
FOREST
SANPETE CO.
SEVIER CO.
YOUNGS POINT

The western bluebird is an uncommon summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. Where as the mountain bluebird is a common yearlong resident of the area. Both birds are cavity nesting species. The western bluebird nests from the pinyon-juniper habitat of the submontane ecological association up into the lower forest habitats within the Canadian life zone of the montane ecological association. The mountain bluebird utilizes the same continum of habitats for nesting, but also extends its nesting use across the Canadian and Hudsonian life zones and into the Alpine life zone. During winter both species show elevational and longitudinal migrations; they then utilize all habitats associated with the cold desert ecological association. Therefore, the substantial valued use area for each species spans a broad continum of habitats. It is important to note that trees with cavities located on the project area can be of critical value to bluebirds.

Grace's warbler is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is shrublands and associated ponderosa forest habitats of the submontane and montane ecological associations. This bird's next is built twenty or more feet above ground in a ponderosa tree. It is important to note that the Grace's warbler has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

Scott's oriole is also a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use areas are riparian habitats characterized by cottonwood stands and the continum of habitats extending from the pinyon-juniper forest into shrublands of the submontane ecological association. The oriole's nest is characterized as a grassy pouch and is hung in a tree. It is important to note that the Scott's oriole has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

Mammals - Species Occurrence and Use Areas

Eighty-four species of mammals, of which 25 percent are protected, are known to inhabit the biogeographic area in which the project and adjacent areas are located. It is probable that seventy-five of these species inhabit the project area (Reference the Division Publication No. 78-16). Twenty-six species of the mammals inhabiting the project area have been determined to be of high interest to the State of Utah.

The red bat is a summer resident of the biogeographic area that surrounds the project site. The animal roosts in wooded areas (riparian woods and pinion-juniper forests) of the submontane ecological association. Such areas represent this animals substantial valued use area. An occasional individual has been known to utilize caves; those individuals could

TABLE I

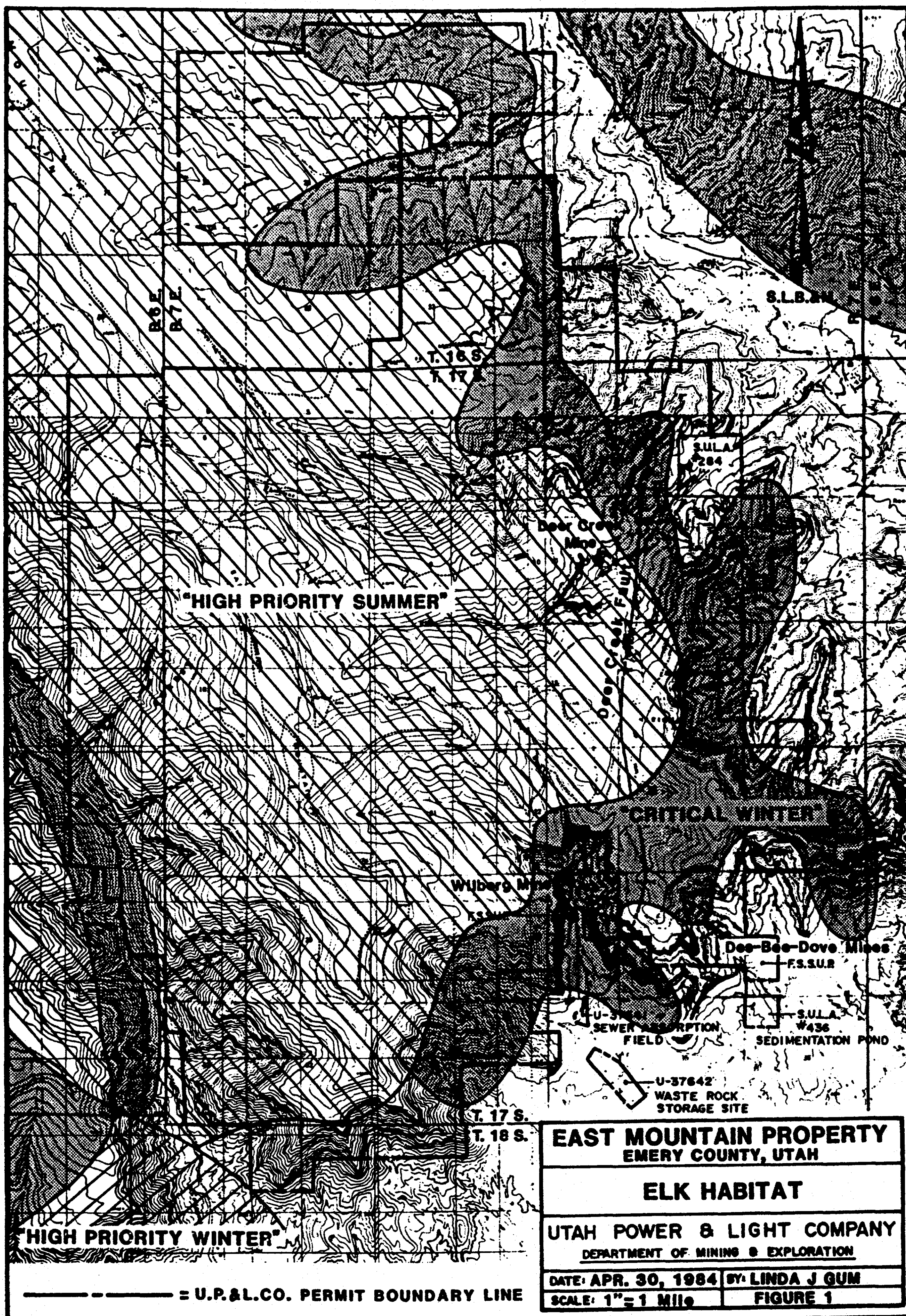
UTAH POWER & LIGHT COMPANY
MINING DIVISION
COTTONWOOD MINE - GOLDEN EAGLE STUDY
(10 Mile Radius Area)
(1986 and 1987 Surveys Conducted by UP&L, UDWR and USFWS)
(1988 Survey Conducted by UP&L and UDWR)

NEST NO.	1986	1987	1988
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

NEST NO.	1986	1987	1988
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

NEST NO.	1986	1987	1988
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

NEST NO.	1986	1987	1988
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



MAP PACKET 2-18 ADDITION 6/12/84