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Refer to Record No. 0016
in C0150025, 2007, Incoming
for additional information

Chapter 1

R645-301-100 General Contents

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R645-301-112 Identification of Interests

112.100 Statement of corporation

C.W. Mining Company is a corporation, incorporated in the state of Utah. C.W. Mining Company is the payer of the abandoned mine reclamation fee. Federal Identification Number: 87-0399230.

112.200-230 Names, addresses, and telephone numbers of the applicant, and the applicant's resident agent who will accept service of process.

Applicant: C.W. Mining Company
53 W Angelo Ave
Salt Lake City, UT 84115
(801) 486-5047

Resident Agent Charles Reynolds
P.O. Box 1245
Huntington, UT 84528
(435) 687-2450

112.300 For Applicants other than single proprietorships:

112.310 Name and address of each officer, partner, principal, principal shareholder, and director or other person performing a function similar to a director

C.O.P Coal Development Company is the fee area and leaseholder of lands within the permit area. C.O.P. Coal Development Company has subleased all fee and federal coal rights to C.W. Mining Company for inclusion in the Bear Canyon LMU.

Corporate Office: C.O.P. Coal Development Co.
3212 South State Street
Salt Lake City, Utah 84115

Name	Title	Address
J. O. Kingston	President	53 West Angelo Ave, S.L.C., Ut. 84115
J. D. Kingston Jr.	Vice President	53 West Angelo Ave, S.L.C., Ut. 84115
Luanna Kingston	Sec./Treas.	53 West Angelo Ave, S.L.C., Ut. 84115

112.320 Not Applicable

112.330 The title of the person's position, date position was assumed, and when submitted under R645-300-147.

Table 1-1 Officers Authorized to Act on Behalf of C. W. Mining Company

Name	Title	Address	Start Date
B. W. Stoddard	President	P.O. Box 300, Huntington, Ut 84528	01/01/76
C. W. Reynolds	Vice Pres.	P.O. Box 1245, Huntington, UT 84528	07/01/04
D. J. Sanders	Sec./Treas.	53 West Angelo Ave., S.L.C., Ut 84115	06/17/93
C. W. Reynolds	Res. Agent	P.O. Box 1245, Huntington, UT 84528	07/01/04

112.340 All names under which the applicant operates or previously operated a coal mine and reclamation operation in the United States within the 5 years preceding the date of application.

C.W. Mining is doing business as (DBA) Co-Op Mining Company

112.350 Not Applicable

112.400 Pending, current, and previous coal mining and reclamation operation permit applications.

C/015/021 Utah Division of Oil Gas and Mining
C/015/025 Utah Division of Oil Gas and Mining

112.410 Federal or State permit numbers and MSHA numbers, the date of issuance, and the regulatory authority.

See Table 1-2 on the following page.

112.420 Not Applicable

Table 1-2 Permits and Licenses

Agency and Address	Permit/License	Reference	ID #	Approval Date
Utah State Division of Oil, Gas & Mining 1594 West Temple Suite 1210 Salt Lake City, Utah 84108-1203	Surface Mining Control and Reclamation Permit	Reclamation Permits	ACT/015/021 ACT/015/025	11/02/89 11/04/85
U.S. Environmental Protection Agency 999 18th street, Suite 500 Denver, Colorado 80202-2405	Prevention of Significant Deterioration Permit (PSD) Spill Prevention Control & Countermeasure Plan	Clean Air Act Amendments of 1977 Federal Water Pollution Control Act	Potential emissions less than 100 tons per year. PSD not required	
State of Utah Division of Water Quality 288 North 1460 West P.O. Box 144870 Salt Lake City, Utah 84114-4870	Utah Pollutant Discharge Elimination System, Utah General Permit for Coal Mining Construction Permits for Sediment Ponds.	Utah Water Pollution Control Act	UTH040006	05/04/89 11/19/85 01/20/93
Utah Division of Water Rights 1636 West North Temple Salt Lake City, Utah 74116-0690	Stream Alteration Permits Water Rights Appropriation of Record of Diversion Dam Design Review	Section 73-3-29 UCA Section 73-5-12 UCA	92-93-02SA 00-93-01SA 01-93-07SA 93-3657 93-1067 92-93-16MD	09/02/92 04/10/02 08/28/02 07/02/92 07/25/86 04/13/92
Industrial Commission of Utah 160 East 300 South SLC, Utah 84151	General Safety Notice of Intent to Mine Coal	Orders Utah Coal Mines		
State of Utah Division of Air Quality 150 North 1950 West SLC, Utah 84114-4820	Air Quality Approval Order	Utah Air Conservation Regulation	DAQE-145-02	02/22/02
U.S. Department of Labor Mine Safety & Health P.O. Box 25367, D.F.C. Denver, Co 80225-0367	Mine Permit	Mine Safety and Health Act	42-00081-0 42-01697 42-02095 42-02263 42-02335	12/22/78 09/27/80 03/09/94 12/14/99 03/08/02
U.S. Department of Interior, Bureau of Land Management, Moab Dist. P.O. Box 970 Moab, Utah 84532	Resource Recovery and Protection Plan Logical Mining Unit	43 CFR 3482	UT-070 UTU-73342	12/20/01 04/20/90
Emery County Zoning Commission P.O. Box 297 Castle Dale, Utah 84513	Zoning Approval			04/07/80 06/20/01

112.500 & 112.600 Surface ownership, subsurface ownership and description of permit area.

Plate 1-1 shows the Permit Area, Plate 1-2 shows Surface Ownership, Plate 1-3 shows Sub-Surface Ownership. The initials COP on the plates stand for C.O.P. Coal Development Company. Table 1-3 lists the owners of the surface and mineral property rights within the permit area.

Table 1-3 Property Ownership

	Surface	Coal	Minerals	Grazing	Oil & Gas
A	1	1	1	1	1
B	2	3	3	2	3
C	1	3	3	1	3
D	3	3	3	3	3
E	2	1	1	2	1

1. C.O.P. Coal Development Co.
   3212 South State Street
   Salt Lake City, Utah 84115

2. U.S. Forest Service
   599 W. Price River Drive
   Price, Utah 84501

3. Bureau of Land Management
   125 South 600 West
   Price, Utah 84501

See Plate 1-2 for location of areas A, B, C, D, and E.

Plate 1-1 shows the Permit Area, Plate 1-2 shows Surface Ownership, Plate 1-3 shows Sub-Surface Ownership. The initials COP on the plates stand for C.O.P. Coal Development Company. Table 1-3 lists the owners of the surface and mineral property rights within the permit area.

Federal lease U-024316, U-024318, U-020668, U-38727, U-46484, U-61048, and U-61049 are held by C.O.P. Coal Development Co. Fee Surface Area and Fee and Federal Coal Rights are leased by Co-Op Mining Company from C.O.P. Coal Development Co. (See letter from C.O.P. Coal Development Company, Appendix 2-A).

The lease guarantees Co-Op the right to mine and remove from, and for purposes incident to mining, including access roads, camp facilities, surface operations, storage of coal, and other activities; also unrestricted use of all access roads leading to and from the property.

A total of 10,991.83 acres are included in the permit area. This includes 6,615.43 acres of federal coal and 4,376.40 acres of private coal owned by C. O. P. Development.

Following is a description of the Permit Area.

Permit Area

A.	T16S, R7E SLBM	Sec.	14 S1/2
		Sec.	23 E1/2, E1/2 W1/2
		Sec.	24 W1/2, W1/2 E1/2
		Sec.	25 NW1/4 NW1/4, E1/2 NW1/4, SW1/4 SW1/4, E1/2 SW1/4
		Sec.	26 NE1/4 NE1/4, NW1/4 NE1/4, N1/2 SW1/4 NE1/4 and the access/haul road and topsoil storage area as shown on Plate 2-1.
	T16S, R8E SLBM	Sec.	7 NE1/4, NE1/4
		Sec.	8 NW1/4, W1/4 E1/2, N1/2 SW ¼, SE1/4 SW1/4
		Sec.	16 All
		Sec.	17 All
		Sec.	21 E1/2 NW1/4, NE1/4, N1/2 SE1/4
B.	T16S, R7E SLBM	Sec.	1 Lots 1 and 2, S1/2 NE1/4, SE1/4
		Sec.	10 N1/2, N1/2 S1/2, SE1/4 SW1/4, S1/2 SE1/4
		Sec.	11 All
		Sec.	12 All
		Sec.	13 ~~W1/4~~ All
		Sec.	14 NE1/4, E1/2 NW1/4
		Sec.	24 ~~E1/2 SE1/4, SE1/4 NE1/4~~ E1/2, E1/2,
		Sec.	25 E1/2
	T16S, R8E SLBM	Sec.	18 SW1/4, SW1/4
		Sec.	19 S1/2 NW1/4, SW1/4, SW1/4 SE1/4, N1/2 SE1/4, S1/2 NE1/4
		Sec.	20 S1/2 NW1/4, N1/2 SW1/4
		Sec.	30 W1/2, W1/2 NE1/4, Nw1/4 SE1/4
C.	T16S, R7E SLBM	Sec.	25 SW1/4 NW1/4, NW1/4 SW1/4
	T16S, R8E SLBM	Sec.	6 Lots 11-14, E1/2 SW1/4, W1/2 SE1/4, SE1/4 SE1/4
		Sec.	7 all except NE1/4 NE1/4
		Sec.	8 SW1/4, SW1/4
		Sec.	18 N1/2, SE1/4, N1/2 SW1/4, SE1/4 SW1/4
D.	~~T16S, R7E SLBM~~	~~Sec.~~	~~25 E1/2~~
	T16S, R8E SLBM	~~Sec.~~	~~30 W1/2, W1/2 NE1/4, NW1/4 SE1/4~~
		Sec.	31 NE1/4 NW1/4, NW1/4 NE1/4
E.	T6S, R8E SLBM	Sec.	19 Lot 1, NE1/4 NW1/4, N1/2 NE1/4
		Sec.	20 N1/2 NW1/4, NE1/4, NE1/4, NE1/4
			21 W1/2 NW1/4, N1/2 SW1/2, SE1/4 SW1/4, S1/2 SW1/4

Note: Letter corresponds with ownership shown in Table ~~2-1~~1-3

~~The lease guarantees Co-Op the right to mine and remove from, and for purposes incident to mining, including access roads, camp facilities, surface operations, storage of coal, and other activities; also unrestricted use of all access roads leading to and from the property. A total of 3,336.18 acres are included in the permit area.~~

112.700 Mine associated structures MSHA numbers

Structure	MSHA ID No.
Bear Canyon #1 Mine	MSHA # 42-01697
Bear Canyon #2 Mine	MSHA # 42-02095
Bear Canyon #3 Mine	MSHA # 42-02263
Bear Canyon #4 Mine	MSHA # 42-02335

112.800 Interest in Lands, options, or bids for lands continguous to the permit area.

There are no current interests, options or pending bids for lands contiguous to the permit area.

112.900 Not Applicable

R645-301-113 Violation Information

113.100 A statement as to whether the applicant has:

113.110 Had a federal or state coal mining permit revoked

C. W. Mining Co. has had no federal or state mining and reclamations permits revoked.

113.120 Forfeited a performance bond or security deposit

C. W. Mining Co. has never forfeited a performance bond.

113.200-240 Not Applicable

113.300-350 For any violation include the date of issuance and identity of the issuing regulatory authority. A brief description of the violation alleged in the notice. The date and location of any judicial proceeding initiated concerning the violation. The current status of the proceedings and of the violation notice. The actions taken by any person identified to abate the violation.

Violation information for C. W. Mining Company is given in Appendix 1-A

R645-301-114 Right of Entry Information

114.100-300 A description of the documents upon which the legal right to enter and begin coal mining and reclamation is based.

The applicant's right to enter the lands and to conduct operations in the permit area is based on the documents listed below. (See Appendix 1-B)

1. Title or Title Insurance Policy
2. Deed or Trust Deed
3. Utah Business License
4. County Business License
5. Tax Commission License
6. Coal Leases
7. Etc.

A statement concerning the lease between C.O.P. and Co-Op to mine coal is found in Appendix 1-B. ~~This lease includes the area that Co-Op will use for the shower house proposed in 1992.~~

R645-301-115 Status of Unsuitability Claims

115.100 Information as to whether the permit area is within an area designated as unsuitable for coal mining and reclamation operations.

No portion of the area to be permitted is within an area designated as unsuitable for mining under the provision of 30 CFR 764 and 765. To the best of the applicant's knowledge, no portion of the area to be permitted is under study of designation as unsuitable for mining in an administrative preceding under 30 CFR 764 and 765.

In preparing this application, Co-Op has conducted the most comprehensive study known to date of the suitability of the permit area. That study makes up the chapters that follow in this report.

State and Federal regulations allow an area to be unsuitable for the mining of coal if:

1. Reclamation is not economically or technologically feasible.

   Reclamation at the Bear Canyon Mine is economically and technologically feasible. Reclamation plans are detailed in R645-301-240.

2. Coal mining is incompatible with state and local land use.

   Coal mining is compatible with present and future land use of the permit area. R645-301-411 describes land use in detail.

3. Mining would affect fragile or historical lands and significantly damage historical, cultural, scientific, or aesthetic values of natural systems.

The permit area is neither historically significant nor fragile. There is only one archaeological site in the permit area, which will not be affected by mining and reclamation activities. (see R645-301-411.143.) Damage to natural systems will be minimal and will be mitigated (R645-301-535), and R645-301-731). The area contains no endangered animal or plant species (R645-301-322).

4. Mining would effect renewable-resource lands and result in substantial losses of food, fiber, or water supply.

The permit area contains no prime farmland (R645-301-221) and limited merchantable timber (R645-301-411.120). The mine will have only minor impact, some of it beneficial, on water resources (R645-301-731.100).

5. Mining would affect natural-hazard lands and thereby endanger life and property. The permit lands are not natural-hazard lands.

In addition, the permit area includes no cemeteries, no national trails, no wild and scenic rivers, no wilderness study areas, and no significant harvestable forest cover.

115.200 Claim of exemption as described in R645-301-333

No exemption claimed

115.300 Information regarding owners of nearby buildings

Waiver letters from the occupants of dwellings located within 300 feet of the coal mining operations are found in Appendix 1-F. The dwelling nearest to the underground mine workings is the hunting cabin. Pictures were taken in 2004 for the pre-blast survey and are stored at the mine site.

R645-301-116 Permit Term

116.100 Starting and termination dates and the anticipated number of acres to be affected during each phase of mining over the life of the mine.

The mine started construction in 1981 and was in production by late fall of 1981.

Termination dates anticipated for each phase of mining are nebulous at this time although a detailed estimate of production and reserves are included in the Geology Section and a projection of ~~33~~ 13 years appears realistic (from ~~199~~ 2005). The final termination date for the mining operation is expected to be ~~2012~~ 2018.

The actual surface acreage disturbed by the mine operation is identified in Table 1-4, ~~and~~ R645-301-222.300, and R645-301-240. Plate 1-1 shows the permit area and Plates 5-2 show the surface facilities and disturbed area.

Table 1-4 Surface Disturbance Summary			
DESCRIPTION	**Total acres**	**Pre-1977 acres**	**New acres**
Ball Park Topsoil Pile	1.27	-0-	1.27
Lower Haul Road	1.60	1.60	-0-
Sed Pond B & Scale Office Pad	2.60	1.23	1.37
Sed Pond A	0.75	-0-	0.75
Main Pad Area	12.32	8.89	3.43
Portal Access Road	3.25	0.02	3.23
Blind Canyon Seam Portal Area	1.81	0.51	1.30
Upper Storage Pad	0.87	-0-	0.87
Shower House Pad	1.83	-0-	1.83
Tank Seam Access Road	2.91	-0-	2.91
Tank Seam Portal Pad	0.66	-0-	0.66
No. 3 Mine Access Road	3.26	-0-	3.26
Conveyor belt Access/Topsoil Stockpile	1.50	-0-	1.50
Upper Conveyor belt Access Road No. 2	0.96	-0-	.96
WHR Blind Canyon Seam Portal Area	1.58	-0-	1.58
No. 4 Mine Access Road	2.74	-0-	2.74
WHR Tank Seam Portal Pad Area	0.55	-0-	0.55
TOTAL	40.46	12.25	28.21

116.200 No Response is needed

R645-301-117 Insurance, Proof of Publication and Facilities or Structures Used in Common

117.100 Proof of liability insurance.

Co-Op carries public liability and property damage insurance in due force. In response to OSM's completeness statement, this policy has been increased to comply with the requirements of 30 CFR 806.14 and R645-301-117. The policy bears a rider requiring the insurer to notify OSM and DOGM if the policy is canceled. A copy of the certificate of insurance and rider is supplied to the Utah Division of Oil, Gas, and Mining (Appendix 1-C).

117.200 Proof of publication in newspapers for permit, significant revision, and permit renewal.

As required with the filing of this application with the Division of Oil, Gas, and Mining, the applicant has filed an advertisement with the Emery County Progress and Salt Lake Tribune, local newspapers with circulation in Emery & Carbon countries sufficient to cover the locality of the applicant's operations. This advertisement follows the format required under 30 CFR 786.11 9aO and R645-300-121. Proof of publication can be found with a copy of the publication in Appendix 1-D.

117.300 Facilities Shared With Other Operations

Not Applicable

R645-301-120 Permit Application Format and Contents

R645-301-130 Reporting of Technical Data

All technical data submitted is accompanied by the names of persons or organizations that collected and analyzed the data along with the dates it was collected and analyzed and the methods used.

131.000 No Response Necessary

132.000 No Response Necessary

R645-301-140 Maps and Plans

All maps of the permit area are at a scale of 1:6,000 or larger. All maps of adjacent area are at a scale of 1:24,000 or larger and clearly show the lands and waters. All maps include the types of information set forth U.S.G.S. 1:24,000 scale series. All maps distinguish which phase of operation it is showing, and which areas mining and reclamation has occurred.

R645-301-150 Completeness

All information required under R645-301 will be included.

Appendix 1A
Violation Information

Bear Canyon Permit # C/015/025

Below is a list of violations received for the above referenced permit number in the previous three years as of 2/14/06

N-04-46-1-1

The violation was issued 4/26/04 because ditches and culverts did not meet their design capacity. Rocks and sediment were removed from the ditches and culverts to restore them to their design capacity.

N-04-46-2-2

The violation was issued 6/29/04 because the mine refuse from the rock tunnels was being stored in sediment pond D causing it to not have the required storage capacity. The material was moved to the appropriate storage site to abate the violation.

N-05-46-1-1

The violation was issued 4/15/05 because the operator was two weeks late in submitting the fourth quarter water monitoring date for monitoring points SBC-9a, SBC-11, MH-1, and all of the NPDES outfall sites. The sites were all no flow. The amendment was abated by submitting the required information.

N-06-46-1-1

The violation was issued 2/1/06 because the operator failed to collect baseline waster monitoring data in August of 2005. The violation will be abated by collecting the baseline samples in August of 2006.

APPENDIX 1-B

TITLE INSURANCE POLICY

OWNER'S
POLICY

TITLE INSURANCE

ISSUED THROUGH THE OFFICE OF

SOUTHEASTERN UTAH TITLE COMPANY

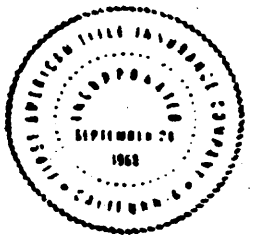
[illegible] PUBLISHER • PRICE, UTAH 84501
(801) 637-1245

SUBJECT TO THE EXCLUSIONS FROM COVERAGE, THE EXCEPTIONS CONTAINED IN SCHEDULE B AND THE PROVISIONS OF THE CONDITIONS AND STIPULATIONS HEREOF, FIRST AMERICAN TITLE INSURANCE COMPANY, a California corporation, herein called the Company, insures, as of Date of Policy shown in Schedule A, against loss or damage, not exceeding the amount of insurance stated in Schedule A, and costs, attorneys' fees and expenses which the Company may become obligated to pay hereunder, sustained or incurred by the insured by reason of

1. title to the estate or interest described in Schedule A being vested otherwise than as stated therein,
2. any defect in or lien or encumbrance on such title,
3. lack of a right of access to and from the land, or
4. unmarketability of such title.

IN WITNESS WHEREOF, First American Title Insurance Company has caused this policy to be signed and sealed by its duly authorized officers on the Date of Policy shown in Schedule A.

First American Title Insurance Company



BY [signature] PRESIDENT

ATTEST [signature] SECRETARY

COUNTERSIGNED

[signature]
ASSISTANT SECRETARY

Form No. [illegible]
ALTA Owner's Policy
Form B - 1970

SCHEDULE A

Total Fee for Title Search, Examination
and Title Insurance [redacted]
Order No. [illegible]-E

Amount of Insurance: [redacted]

Policy No. [illegible]

Date of Policy: [illegible]

1. Name of Insured:

C.O.P. COAL DEVELOPMENT COMPANY,
a Utah corporation.

2. The estate or interest referred to herein is at Date of Policy vested in:

C.O.P. COAL DEVELOPMENT COMPANY,
a Utah corporation.

3. The estate or interest in the land described in Schedule C and which is covered by this policy is:

FEE SIMPLE

SCHEDULE C

The land referred to in this policy is situated in the County of Emery, State of Utah, and is described as follows:

T16S, R7E, SLB&M

Section 26: E½NW¼ and all that part of SE¼NE¼ and the SE¼ lying West of a Northeast-Southwest fault line.

EXCEPTING THEREFROM all coal.

14: S½

22: E½NE¼, NW¼SE¼, NE¼SE¼

23: All

24: NW¼NW¼ and all that part of the SW¼NW¼ and the W½SW¼ lying West of a Northeast-Southwest fault line.

25: All that part of the NW¼NW¼ lying West of a Northeast-Southwest fault line.

26: W½NE¼, NW¼NW¼, and all that part of the NE¼NE¼ lying West of a Northeast-Southwest fault line.

* * *

AGREEMENT

This agreement made and entered into this 3rd day of August 1983, by and between Emery County, a body corporate and politic (County), and Co-Op Mining Company, a Utah general partnership (Co-Op),

WHEREAS, there is an existing road in Emery County known as Bear Creek Road, and

WHEREAS, Co-Op requires extensive use of said road, and

WHEREAS, due to said extensive use, said road should be relocated for the health, safety and welfare of the citizens of County as well as others who may have occasion to use said road,

NOW, THEREFORE, be it agreed as follows:

1. The parties hereto agree and acknowledge that the southern 0.65 miles of the road known as Bear Creek Road is a County road. Said County road runs from State Road 31 in a northerly direction for approximately 0.65 miles to a presently existing gate. Thereafter the road is a private road.

2. That Co-Op will relocate the Bear Creek Road according to the plans and specifications prepared by the Emery County Engineer and described on the document entitled Bear Canyon County Road Relocation dated October 12, 1982.

3. Co-Op will relocate the Road according to the plans and specifications referred to above at their expense. Co-Op will reimburse County for engineering costs incurred by County concerning the preparation of said plans and specifications and site inspections up to One Thousand ($1,000.00) Dollars.

4. Co-Op will indemnify and defend County for any damage caused, or loss incurred to or claim made by any public or private individual, firm, group, association, partnership or corporation as a result of the construction conducted to relocate Bear Creek Road. Said indemnification will continue until such time as County approves the completed roadway and accepts the construction thereof.

5. Co-Op acknowledges and accepts the easements of North Emery Water Users and Huntington City which exist in, along and across the relocate Bear Creek Road. Said easements are in existence on the ground. Co-Op's acknowledgment thereof herein recognizes and preserves said easements.

6. Co-Op agrees to encase water lines of North Emery Water Users and Huntington City in nestable corrugated pipe pursuant to plans and specifications prepared by the Emery County Engineer.

7. Co-Op agrees to allow access to other property served by the relocated Bear Creek Road. Said access shall be allowed to the owner of the property, their successor in interest or any other individual, firm, group, association, partnership or corporation who requires access due to their association with the owner or because the owner has granted permission to the individual, firm, group, association, partnership or corporation to go upon his property. Co-Op will not withhold access due to the type of activity which the then owner or his agents, employees or invitees intend or in fact conduct.

8. Co-Op will provide a completion and performance bond to Emery County upon the execution hereof in the amount of Twenty-Five Thousand ($25,000.00) Dollars which will remain in force and effect for twelve (12) months after the date said road is accepted by County as indicated in paragraph 4 above.

9. Co-Op will provide liability insurance in an amount not less than Five Hundred Thousand ($500,000.00) Dollars to be in force during the construction of said road. Said policy will name County as an insured.

10. Co-Op agrees to complete said road in a timely manner not to exceed eighteen (18) months from the date of this agreement. County may make demand upon the bonding company under the bond provided pursuant to paragraph 8 above and secure completion of the relocation in the event construction is not completed within the agreed upon eighteen (18) months.

11. It is further understood that any additional improvements of the relocated Bear Creek Road will be at the expense of all primary users.

12. The Co-Op agrees to reclaim that portion of the old Bear Creek Road according to the specifications and requirements of the Bureau of Land Manager (BLM).

13. That the Co-Op agrees to provide Emery County with the necessary easement agreements with the Utah Department of Transportation.

14. Co-Op acknowleges and agrees to comply with standard number 6.3.8 "Protection Zone" of the Utah State Health Drinking Water Standards as it applies to supplies of drinking water in Bear Canyon.

15. County agrees to inspect the relocated Bear Creek Road within ten (10) days after notification by Co-Op of the completion thereof. County must within five (5) working days of said inspection accept the road or notify Co-Op of any deficiencies which must be then corrected by Co-Op within the time period outlined in paragraph 10 above. Should County fail to notify Co-Op of any deficiencies within five (5) working days, the road is deemed accepted by County and the twelve (12) month period indicated in pargaraph 8 above begins to run from the sixth (6th) day after inspection.

IN WITNESS WHEREOF, this agreement is executed the day and year above first written, at Castle Dale, Utah, pursuant to a resolution of the Emery County Board of Commissioners at a regularly scheduled meeting of the Board.

EMERY COUNTY, a body politic and corporate,

ATTEST

County Clerk

By Rue P. Ware
Chairman of the Emery County Board of Commissioners

IN WITNESS WHEREOF this agreement is executed at Huntington, Utah.
DATED this 3rd day of August, 1983.

CO-OP MINING COMPANY, a Utah general partnership

By B W Stoddard
a General Partner

CORPORATION SPECIAL WARRANTY DEED

THIS CORPORATION SPECIAL WARRANTY DEED, made this 6 day of August, 1980, by PEABODY COAL COMPANY ("Grantor"), a Delaware corporation at 301 North Memorial Drive, P.O. Box 235, St. Louis, Missouri 63166, to C.O.P. COAL DEVELOPMENT COMPANY ("Grantee"), a Utah corporation at 3753 South State Street, Salt Lake City, Utah 84115.

Grantor, for and in consideration of the sum of $10.00 and other valuable consideration in hand paid by Grantee, receipt whereof is hereby acknowledged, conveys and, as hereinafter provided, warrants to the Grantee, and to its successors, heirs, and assigns, forever, all of that real estate ("Property"), situated in Emery County, Utah, described in Appendix D-1 affixed hereto and hereby made a part hereof.

Together with all the hereditaments and appurtenances thereunto belonging, and with all the estate, right, title, interest, claim or demand whatsoever, of the Grantor, either in law or equity of, in and to the Property.

TO HAVE AND TO HOLD the Property unto the Grantee, his heirs, successors and assigns forever; provided, however, that this conveyance is made and accepted upon the following covenants, which shall be binding upon and enforceable against Grantee and his heirs, successors and assigns and shall be deemed covenants running with the land:

(a) Grantee knows and understands that the Property may include mined-out areas with rough, unnatural and unstable surfaces, loose rocks and shale, open pits and shafts, slurry ponds, haulage roads, areas which have been used for blasting, subsidence areas and areas which have been used for operation of heavy equipment;

(b) Grantee assumes all risks and responsibility for any injuries or damages sustained by any person or to any property, in whole or in part, resulting from, arising out of, or in any way connected with, the possession or use of the Property by Grantee, and Grantee agrees to indemnify and hold harmless Grantor, its agents, employees or representatives, from any and all claims, demands, actions, or suits of any kind or nature whatsoever for such injuries and damages, and any expenses connected therewith;

(c) Grantor does not warrant or represent subjacent or lateral support of the surface and subsurfaces of the Property;

(d) Grantor does not warrant or represent that the Property is safe, habitable, or otherwise suitable for the purposes for which it is intended to be used by Grantee or for any other purpose whatsoever. Grantee represents that he has inspected the Property and agrees to accept the same "as is".

The Grantor, for itself and for its successors, does represent, warrant, promise, and agree to and with the Grantee, its heirs, successors and assigns, that Grantor has not done, or suffered to be done, anything whereby Grantor's estate in said Property hereby granted is, or has been, in any manner encumbered or charged, except as herein recited; and that Grantor will warrant and forever defend Grantor's estate in Property against all

persons lawfully claiming, or to claim the same, by, through, or under Grantor.

The conveyance is subject to all rights-of-way, easements, leases, deed and plat restrictions, partitions, severances, encumbrances, licenses, reservations and exceptions which are of record as of the date first above written, and to all rights of persons in possession, and to physical conditions, encroachments, and possessory rights which would be evident from an inspection of the Property, and to taxes and assessments not delinquent; and to all reservations and exceptions (if any) stated in Appendix D-1.

IN WITNESS WHEREOF, said Grantor has caused its corporate seal to be hereto affixed, and has caused its name to be signed to these presents by its Vice President of Resource Management, and attested by its Assistant Secretary, the day and year first above written.

ATTEST:

J. M. Tonhill

Title:

PEABODY COAL COMPANY

By James F. Hobbs

Title:

STATE OF Missouri)
) ss.
COUNTY OF St. Louis)

On the 4th day of August, 1980, personally appeared before me JAMES F. HOBBS, who being by me duly sworn, did say that he is the Vice President, Resource Management of Peabody Coal Company, and that the attached instrument was signed in behalf of said corporation by authority of a resolution of the Board of Directors and said JAMES F. HOBBS acknowledged to me that said corporation executed the same.

Given under my hand and notarial seal this 4th day of August, 1980.

Marian E. Weir
Notary Public
MARIAN E. WEIR

My Commission Expires:
May 27, 1982

THIS INSTRUMENT PREPARED BY:
James C. Sevem, Attorney
301 North Memorial Drive
St. Louis, Missouri 63102

PROPERTY

SURFACE LANDS

Township 16 South, Range 7 East, SLM(Utah)
Section 26: E 1/2 NW 1/4; all that part of SE 1/4 NE 1/4 and SE 1/4 lying West of a Northeast-Southwest fault line.

COAL LANDS

Township 16 South, Range 7 East, SLM(Utah)
Section 14: S 1/2
Section 22: E 1/2 NE 1/4, NW 1/4 SE 1/4, NE 1/4 SE 1/4
Section 23: All
Section 24: NW 1/4 NW 1/4, all that part of the SW 1/4 NW 1/4 lying West of a Northeast-Southwest fault line, all that part of the W 1/2 SW 1/4 lying West of a Northeast-Southwest fault line.
Section 25: All that part of the NW 1/4 NW 1/4 lying West of a Northeast-Southwest fault line.
Section 26: All that part of the NE 1/4 NE 1/4 lying West of a Northeast-Southwest fault line, W 1/2 NE 1/4, NW 1/4 NW 1/4

STATE OF UTAH, COUNTY OF EMERY, ss. RECORDED FE... 02 PM '80 ... PAGE ... REC'D

PARTIAL ASSIGNMENT OF FEDERAL COAL LEASE UTAH 024318

THIS ASSIGNMENT, made this 1st day of April, 1980, by PEABODY COAL COMPANY ("Assignor"), a Delaware Corporation at 301 North Memorial Drive, P.O. Box 235, St. Louis, Missouri 63166, to C.O.P. COAL DEVELOPMENT COMPANY ("Assignee"), a Utah corporation at 3753 South State Street, Salt Lake City, Utah 84115.

Assignor, for and in consideration of the sum of $10.00 and other valuable consideration in hand paid by the Assignee, the receipt and sufficiency of which are hereby acknowledged, does ASSIGN, TRANSFER, CONVEY, AND, AS HEREINAFTER STATED, WARRANT unto Assignee, and to its successors, heirs, and assigns forever, all Assignor's right, title and interest in and to Assignor's leasehold estate, and all property rights of Assignor held in connection therewith, in that certain Coal Lease from the United States of America (Appendix E-2-1 attached), which bears serial number Utah 024318, but only insofar as said estate and rights relate to that certain real estate ("Federal Property"), which is described in Appendix E-2-2 affixed hereto and made a part hereof.

Assignee accepts the foregoing assignment and does hereby assume and agree to pay and discharge, or cause to be paid and discharged, all obligations and liabilities of Assignor under said Coal Lease from and after the date hereof, but only insofar as such obligations and liabilities relate to the said Federal Property.

The Assignor, for itself and for its successors, does represent, warrant, promise and agree to and with the Assignee, its successors, heirs and assigns, that Assignor has not done, or suffered to be done, anything whereby Assignor's estate in said Federal Property hereby granted is, or has been, in any manner encumbered or charged, except as herein recited; and that Assignor will warrant and forever defend Assignor's estate in said Property against all persons lawfully claiming, or to claim the same, by, through, or under Assignor.

The assignment is subject to grazing rights and to those rights-of-way, easements, leases, deed and plat restrictions, partitions, severances, encumbrances, licenses, reservations, and exceptions which are of record on this assignment date, and to all rights of persons in possession, and to physical conditions, encroachments and possessory rights which would be evident from an inspection of the Federal Property.

The Assignee agrees to reassign the said partial Federal Lease to Assignor, with special warranties of title, in the event the transactions contemplated by the Contract for the Sale of Real Estate dated April 1, 1980, between the parties are not closed by the Closing Date contained in said Contract.

IN WITNESS WHEREOF, said Assignor has caused its corporate seal to be hereto affixed, and has caused its name to be signed to these presents by its Vice President of Resource Management and attested by its Assistant Secretary, the day and year first above written.

ATTEST:

Title: Assistant Secretary

PEABODY COAL COMPANY

By

Title: Vice President
Resource Management

ACCEPTED BY C.O.P. COAL DEVELOPMENT COMPANY

By

Title: Vice President

STATE OF Missouri)
) ss.
COUNTY OF St. Louis)

On the 1st day of April, 1980, personally appeared before me JAMES F. HOBBS, who being by me duly sworn, did say that he is the Vice President, Resource Management of Peabody Coal Company, and that the attached instrument was signed in behalf of said corporation by authority of a resolution of the Board of Directors and said JAMES F. HOBBS acknowledged to me that said corporation executed the same.

Given under my hand and notarial seal this 1st day of April, 1980.

Notary Public

My Commission Expires:
June 7, 1983

STATE OF Illinois)
) ss.
COUNTY OF Saline)

On the 1 day of April, 1980, personally appeared before me [illegible], who being by me duly sworn, did say that he is the [illegible] of C.O.P. Coal Development Company and that the attached instrument was signed in behalf of said corporation by authority of a resolution of the Board of Directors and said [illegible] acknowledged to me that said corporation executed the same.

Given under my hand and notarial seal this 1 day of April, 1980.

Notary Public

My Commission Expires:
[illegible]

Assignment Approved Effective:

THE UNITED STATES OF AMERICA

By

Chief Adjudication Branch
Bureau of Land Management

THIS INSTRUMENT PREPARED BY:
J. C. Bevem, Attorney
301 North Memorial Drive
St. Louis, Missouri 63102

APPENDIX E-2-2

FEDERAL PROPERTY

255-018 Township 16 South, Range 7 East, SLM (Utah)
Section 26: E 1/2 NW 1/4

PARTIAL ASSIGNMENT OF FEDERAL COAL LEASE UTAH 024316

THIS ASSIGNMENT, made this 1st day of April, 1980, by PEABODY COAL COMPANY ("Assignor"), a Delaware Corporation at 301 North Memorial Drive, P.O. Box 235, St. Louis, Missouri 63166, to C.O.P. COAL DEVELOPMENT COMPANY ("Assignee"), a Utah corporation at 3753 South State Street, Salt Lake City, Utah 84115.

Assignor, for and in consideration of the sum of $10.00 and other valuable consideration in hand paid by the Assignee, the receipt and sufficiency of which are hereby acknowledged, does ASSIGN, TRANSFER, CONVEY, AND, AS HEREINAFTER STATED, WARRANT unto Assignee, and to its successors, heirs, and assigns forever, all Assignor's right, title and interest in and to Assignor's leasehold estate, and all property rights of Assignor held in connection therewith, in that certain Coal Lease from the United States of America (Appendix E-1-1 attached), which bears serial number Utah 024316, but only insofar as said estate and rights relate to that certain real estate ("Federal Property"), which is described in Appendix E-1-2 affixed hereto and made a part hereof.

Assignee accepts the foregoing assignment and does hereby assume and agree to pay and discharge, or cause to be paid and discharged, all obligations and liabilities of Assignor under said Coal Lease from and after the date hereof, but only insofar as such obligations and liabilities relate to the said Federal Property.

The Assignor, for itself and for its successors, does represent, warrant, promise and agree to and with the Assignee, its successors, heirs and assigns, that Assignor has not done, or suffered to be done, anything whereby Assignor's estate in said Federal Property hereby granted is, or has been, in any manner encumbered or charged, except as herein recited; and that Assignor will warrant and forever defend Assignor's estate in said Property against all persons lawfully claiming, or to claim the same, by, through, or under Assignor.

The assignment is subject to grazing rights and to those rights-of-way, easements, leases, deed and plat restrictions, partitions, severances, encumbrances, licenses, reservations, and exceptions which are of record on this assignment date, and to all rights of persons in possession, and to physical conditions, encroachments and possessory rights which would be evident from an inspection of the Federal Property.

The Assignee agrees to reassign the said partial Federal Lease to Assignor, with special warranties of title, in the event the transactions contemplated by the Contract for the Sale of Real Estate dated April 1, 1980, between the parties are not closed by the Closing Date contained in said Contract.

IN WITNESS WHEREOF, said Assignor has caused its corporate seal to be hereto affixed, and has caused its name to be signed to these presents by its Vice President of Resource Management and attested by its Assistant Secretary, the day and year first above written.

ATTEST:

Title: Assistant Secretary

PEABODY COAL COMPANY

By James F. Hobbs

Title: Vice President
Resource Management

ACCEPTED BY C.O.P. COAL
DEVELOPMENT COMPANY

By Joseph C. Kingston

Title: Vice President

STATE OF Missouri)
) ss.
COUNTY OF St. Louis)

On the 1st day of April, 1980, personally appeared before me JAMES F. HOBBS, who being by me duly sworn, did say that he is the Vice President, Resource Management of Peabody Coal Company, and that the attached instrument was signed in behalf of said corporation by authority of a resolution of the Board of Directors and said JAMES F. HOBBS acknowledged to me that said corporation executed the same.

Given under my hand and notarial seal this 1st day of April, 1980.

James C. Sevem
Notary Public

My Commission Expires:
June 7, 1983

STATE OF Utah)
) ss.
COUNTY OF Salt Lake)

On the 1 day of April, 1980, personally appeared before me Joseph C. Kingston who being by me duly sworn, did say that he is the Vice President of C.O.P. Coal Development Company, and that the attached instrument was signed in behalf of said corporation by authority of a resolution of the Board of Directors and said Joseph C. Kingston acknowledged to me that said corporation executed the same.

Given under my hand and notarial seal this 1 day of April, 1980.

Notary Public

My Commission Expires:

Assignment Approved Effective:

THE UNITED STATES OF AMERICA

By

Chief Adjudication Branch
Bureau of Land Management

THIS INSTRUMENT PREPARED BY:
J. C. Sevem, Attorney
301 North Memorial Drive
St. Louis, Missouri 63102

APPENDIX E-1-2

FEDERAL PROPERTY

255-016 Township 16 South, Range 7 East, SLM (Utah)
Section 13: W 1/2 W 1/2
Section 14: E 1/2 NW 1/4, NE 1/4
Containing 400 acres, more or less.

R-226 (Rev. 1/77)
HIGHWAY RIGHT-OF-WAY
ENCROACHMENT

PERMIT

10844

District No. 4 Date October 1, 1982 Application of Co-op Mining Company, By Sonde . Owen, Title Manager

Address P.O. Box 1245, Huntington, Utah Phone 748-5-38, in Emery County

is hereby granted, subject to the Regulations for the Control and Protection of State Highway Rights-of-Way, Standard Specifications for Road and Bridge Construction, Specifications for Excavation on State Highways, General Safety Orders of the Industrial Commission, Safety Manual for Road and Bridge Construction, Instructions to Flagmen, the approved plans, and any special limitations set forth herein, permission for the purpose of excavate to construct an approach 30' wide for a coal haul road.

within right-of-way limits of Highway No. 31, State Maintenance Section No. 08-31-01, Milepost No. 32, in the following location:

about 12 miles northwest of the jct. of SR-10 & SR-31 on the east side of the highway.

Receipt of $5.00 permit fee is hereby acknowledged (delete where not applicable). The work permitted herewith shall commence October 2, 1982 and shall diligently be prosecuted to completion. The work shall be completed and all disturbed surfaces or objects restored on or before October 30, 198. . In the event work is commenced under this permit, the applicant agrees to prosecute the same to completion by the date herein above specified. In the event the applicant fails or refuses to complete the work the Utah Department of Transportation may, at its election, fill in or otherwise correct any existing impediments at the expense of and subject to immediate payment by the applicant.

Applicant shall execute a bond in the minimum amount of $1000, increased by multiples thereof as determined by the District Director, to insure faithful performance of the permittee's obligation. The bond shall remain in force for three years after completion of the work.

Before work permitted herewith is commenced, the applicant shall notify: John Cox at Huntington 687-9969 and commencement of said work is understood to indicate that the applicant will comply with all instructions and regulations of the Utah Department of Transportation with respect to performance of said work, and that he will properly safeguard said work to prevent accident and shall indemnify and hold harmless the Utah Department of Transportation from all damages arising out of any and all operations performed under this Permit.

Permittee shall not perform any work on State Highway right-of-way beyond those areas or operations stipulated on the permit.

If applicant fails to comply with Utah Department of Transportation regulations, specifications, or instructions pertinent to this permit, the District Director or his duly authorized representative may by verbal order suspend the work until the violation is corrected. If the applicant fails or refuses to comply promptly, the District Director or his authorized representative may issue a written order stopping all or any part of the work. When satisfactory corrective action is taken, an order permitting resumption of work may be issued.

Special Limitations: Per agreement with the B.L.M. & attached map.

(Signature of Applicant)

Approved by: [signature]
For District Director

THIS COPY MUST BE CONSPICUOUSLY POSTED AT THE ENCROACHMENT SITE DURING THE ENTIRE ENCROACHMENT PERIOD

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Moab District
San Rafael Resource Area
P. O. Drawer AB
Price, Utah 84501

IN REPLY REFER TO:

9230
UT-060-6434
UT-060-6438
(U-067)

SEP 19 1983

Mr. Wendell Owen
CO-OP Mining Company
P. O. Box 1245
Huntington, Utah 84528

Dear Mr. Owen:

Right-of-way U-52411 was issued to Emery County on September 15, 1983, for the Bear Canyon Road. A copy of the agreement between your company and the County has been received. We are therefore closing Trespasses UT-060-6434 and UT-060-6438.

Sincerely yours,

Area Manager

cc: Joe Helfrich, Utah Div. of Oil, Gas and Mining
4241 State Office Building, SLC, UT 84114

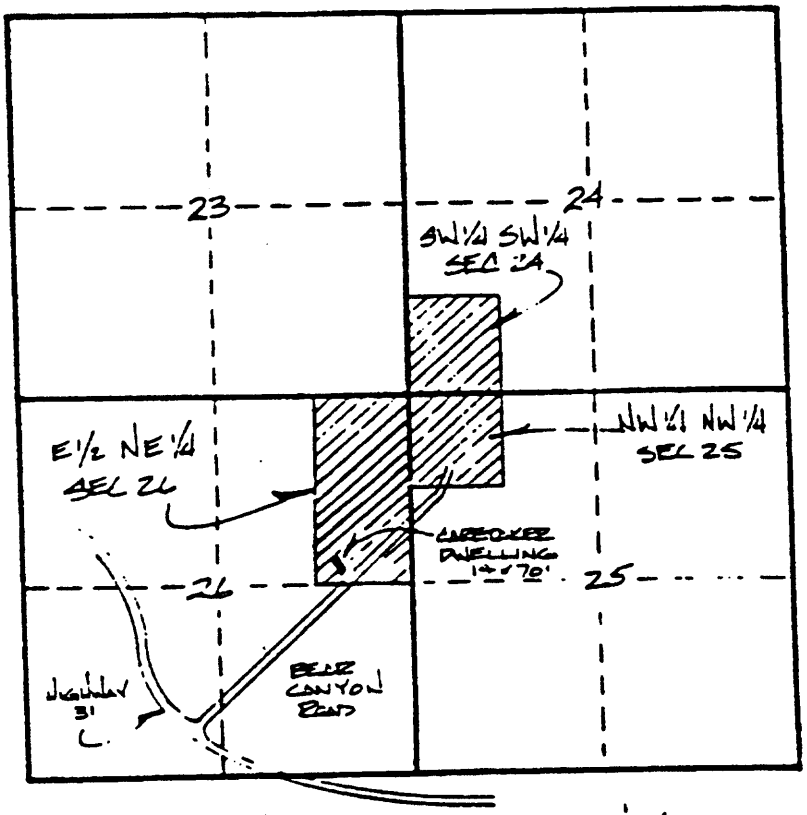
PROPERTY DESCRIPTION

THE SW1/4 OF THE SW1/4, SECTION 24,
T 16 S, R 7 E, SLB&M

THE NW1/4 OF THE NW1/4, SECTION 25,
T 16 S, R 7 E, SLB&M

THE EAST 1/2 OF THE NE1/4, SECTION 26,
T 16 S, R 7 E, SLB&M

CONTAINING 160 ACRES TOTAL



T 16 S, R 7 E, SLB&M

KEY MAP

C.O.P. COAL DEVELOPMENT COMPANY
53 West Angelo Avenue
Salt Lake City, Utah 84115

January 21, 2001

State of Utah
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Gentlemen:

Please be advised that C.O.P. Coal Development Company is the record owner of the fee ground and Federal Coal lease #'s 020668, 024316. 024318, 38727, 46484, and 61049, located in Bear Canyon, Emery County, Utah, which includes all of the real property involved in Permit No. Act/015/025. C.O.P. is currently leasing all of the property to Co-op Mining Company and the lease permits Co-op to use the land for coal mining and related activities. This lease agreement will automatically be extended without amendment unless either party gives 30 days written notice of cancellation.

Very truly yours,

Joseph O. Kingston, President
C.O.P. Coal Development Company

JOK/lm

Bureau of Land Management
Utah State Office
P. O. Box 45155
Salt Lake City, Utah 84145-0155

3453
U-020668
U-38727
(U-942)

JAN 13 1992

DECISION

C.O.P. Coal Development Company	:	
53 West Angelo Avenue	:	Coal Leases
Salt Lake City, Utah 84115	:	U-020668 and U-38727

Assignments Approved

On May 17, 1991, assignments of coal leases U-020668 and U-38727 entered into on May 2, 1991, between C.O.P. Coal Development Company, as assignee, and Nevada Electric Investment Company, as assignor, were filed in this office.

Satisfactory evidence of the qualifications and holdings of C.O.P. Coal Development Company has been filed. The lease accounts are presumed to be in good standing inasmuch as neither of the leases appear on the Mineral Management Service (MMS) list of leases with unpaid assessments. The assignee, C.O.P. Coal Development Company, has agreed by letter dated September 18, 1991, to be liable for any delinquent rent/royalty payments discovered through an MMS audit. Therefore, the assignments appear to meet the requirements of the regulations and are hereby approved effective February 1, 1992. Approval of these assignments does not constitute approval of any of the terms therein which may be in violation of the lease terms.

Cash lease bonds in the amount of $5,000 each were filed and accepted on January 10, 1992, with an effective date of February 1, 1992.

Chief, Minerals
Adjudication Section

Enclosure
Assignment

cc: Nevada Electric Investment Company
2835 S. Jones, Suite 5
Las Vegas, Nevada 89102

bcc: Dr. Dianne Nielson
Division of Oil, Gas, and Mining

MMS, AFS, Denver, CO w/encl.
Moab District Office
Price Coal Office
U-921

APPENDIX 1-C

INSURANCE

ACORD CERTIFICATE OF LIABILITY INSURANCE

ISSUER TO COOPM-1

DATE (MM/DD/YY) 01/11/02

ZIONS INSURANCE AGENCY
P.O. Box 27110
Salt Lake City, UT 84127-1150
(801) 273-6000

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.

Co-Op Mining
C. W. Mining Inc. DBA:
P. O. Box 45801
Salt Lake City UT 84145

INSURERS AFFORDING COVERAGE

INSURER A: Federal Insurance Company
INSURER B:
INSURER C:
INSURER D:
INSURER E:

COVERAGES

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. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY [X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC	37107469	01/01/02	01/01/03	EACH OCCURRENCE	$1,000,000
					FIRE DAMAGE (Any one fire)	$100,000
					MED EXP (Any one person)	$10,000
					PERSONAL & ADV INJURY	$1,000,000
					GENERAL AGGREGATE	$2,000,000
					PRODUCTS - COMP/OP AGG	$1,000,000
	AUTOMOBILE LIABILITY [ ] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [ ] HIRED AUTOS [ ] NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident)	$
					BODILY INJURY (Per person)	$
					BODILY INJURY (Per accident)	$
					PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY [ ] ANY AUTO				AUTO ONLY - EA ACCIDENT	$
					OTHER THAN AUTO ONLY: EA ACC	$
					AGG	$
	EXCESS LIABILITY [ ] OCCUR [ ] CLAIMS MADE [ ] DEDUCTIBLE [ ] RETENTION $				EACH OCCURRENCE	$
					AGGREGATE	$
						$
						$
						$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				[ ] STATUTORY LIMITS [ ] OTHER	
					E.L. EACH ACCIDENT	$
					E.L. DISEASE - EA EMPLOYEE	$
	OTHER				E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

Note: Explosion Damage is covered.

Bear Canyon Mine # ACT/015/025
Faxed to 359-3940

CERTIFICATE HOLDER [N] ADDITIONAL INSURED; INSURER LETTER: ____

STATUC1

State of Utah Division of
Oil & Gas
Pamela Grubaug-Littig
1594 West North Temple Su#1210
Salt Lake City UT 84114-5801

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 45 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. [redacted]

David Hind

ACORD 25-S (7/97)

©ACORD CORPORATION 1988

APPENDIX 1-D

AFFIDAVIT OF PUBLICATION

AFFIDAVIT OF PUBLICATION

STATE OF UTAH
County of Emery, } ss.

I, Robert L. Finney, on oath, say that I am the Publisher of The Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the 1st day of April, 19 81, and that the last publication of such notice was in the issue of such newspaper dated the 22nd day of April, 19 81

Robert L. Finney

Subscribed and sworn to before me this 7th day of May, 19 82

Isabelle Finney
Notary Public.

My Commission expires My Commission Expires October 26, 1983, 19

Residing at Price, Utah

Publication fee, $ 41.60

NOTICE OF FILING APPLICATION FOR COAL MINING AND RECLAMATION PERMIT

Co-op Mining Company, Box 300, Huntington, Utah, hereby announces its intent to file application for a coal mining permit for the Bear Canyon mine with the Division of Oil, Gas, and Mining under the laws of the State of Utah. A copy of the complete application is available for public inspection at the Emery County Recorder's Office, Emery County Court House, Castle Dale, Utah 84513. Written comment on the application should be submitted to the State of Utah Oil, Gas, and Mining Division, 1588 West North Temple, Salt Lake City, Utah 84116.

The area to be mined can be found on the USGS Hiawatha quadrangle map. The approximately 820 acres of the permit area are on private property (fee coal area) described as follows:

Area 16 South; Range 7 East SLM

Sec. 14; SW ¼

Sec. 23; E ½; E ½ NW ¼, E ½ SW ¼; SW ¼ SW ¼

Sec. 24; All West of the N-S fault

Sec. 25; All West of the N-S fault

Published in the Emery County Progress April 1, 8, 15 and 22, 1981.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH
County of Carbon, } ss.

I, Dan Stockburger, on oath, say that I am the General Manager of The Sun-Advocate, a weekly newspaper of general circulation, published at Price, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the 30th day of January, 19 87, and that the last publication of such notice was in the issue of such newspaper dated the 19th day of February, 19 87

Dan Stockburger

Subscribed and sworn to before me this 19th day of February, 19 87

Holly Jo Baker
Notary Public.

My Commission expires MY COMMISSION EXPIRES OCTOBER 22, 1990

Publication fee, $ 69.60

[redacted]

Co-Op Mining Company, Box 1245, Huntington, Utah, hereby announces its intent to file application to expand the existing underground mine into the Hiawatha Seam for the Bear Canyon Mine with the Division of Oil, Gas & Mining under the laws of the State of Utah. 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 comment on the application should be submitted to the State of Utah Oil, Gas and Mining Division, 355 West North Temple, 3 Triad Center Suite 350, Salt Lake City, Utah 84180-1203.

The area to be mined can be found on the USGS Hiawatha quadrangle map. The approximate 300 acres of the existing permit area are on private property (fee coal area) described as follows:

Township 16 South; Range 7 East SLBM
Sec. 14: SW¼
Sec. 23 E½, E½NW¼, E½SW¼, SW¼, SW¼
Sec. 24 All West of N-S Fault
Sec. 25 All West of N-S Fault

Published in the Sun Advocate January 30, February 5, 12 and 19, 1987.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH }
County of Emery, } ss.

I, Dan Stockburger, on oath, say that I am the General Manager of the The Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for ....Four (4).... consecutive issues, and that the first publication was on the

....28th....day of....March....., 19..89....

and that the last publication of such notice was in the issue of such newspaper dated the

....18th....day of....April....., 19..89....

Dan Stockburger

Subscribed and sworn to before me this

....18th....day of....April....., 19..89....

Holly Jo Baker
Notary Public.

My Commission expires October 2, 1990
Residing at Price, Utah

Publication fee, $ ....45.60....

NOTARY PUBLIC
My Commission Expires October 2, 1990
HOLLY JO BAKER
76 West Main
Price,
UT 84501
STATE OF UTAH

NOTICE OF FILING AND APPLICATION FOR COAL MINING PERMIT

Co-op mining Company, Box 1245, Huntington, Utah, here announces its intent to file application for a coal mining permit for an addition to the permitted area of the Bear Canyon mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. A copy of the complete application is available for public inspection at the Division of Oil, Gas and Mining offices, 355 W. North Temple, 3 Triad Center, Salt Lake City, Utah 84080. Written comment on the application should be submitted to the State of Utah, Oil Gas and Mining Division, at the above address. The area to be mined can be found on the USGS Hiawatha quadrangle map. The addition is adjacent to the permitted area and is on private property fee coal area described as follows; T16S, R7E, SLM. Sec. 14, SE 1/4.

Published in the Emery County Progress March 28, April 4, 11 and 18, 1989.

143 SOUTH MAIN ST.
P.O. BOX 45838
SALT LAKE CITY, UTAH 84145
FED. TAX I.D. # 87-0217663

Newspaper Agency Corporation
AGENT

The Salt Lake Tribune — MORNING & SUNDAY
DESERET NEWS — EVENING & SUNDAY

Affidavit of Publication

STATE OF UTAH. }
County of Salt Lake } ss.

I Pam Anderson Hereby certify that the attached advertisement of NOTICE OF FILINGAND APPLICATIONFOR COAL MI for CO-OP MINING COMPANY was published by the NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE and DESERET NEWS, daily newspapers printed in the English language with general circulation in Utah, and published in Salt Lake City, Salt Lake County in the State of Utah.

NOTICE OF FILING AND APPLICATION FOR COAL MINING PERMIT

Co-op mining Company, Box 1245 Huntington, Utah, hereby announces its intent to file application for a coal mining permit for an addition to the permitted area of the Bear Canyon mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. A copy of the complete application is available for public inspection at the Division of Oil, Gas and Mining offices, 355 W. North Temple, 3 Triad Center, Salt Lake City, Utah 84180. Written comment on the application should be submitted to the State of Utah, Oil Gas and Mining Division, at the above address. The area to be mined can be found on the USGS Huiwaha quadrangle map. The addition is adjacent to the permitted area and is on private property fee coal area described as follows.
T16S, R7E, SLM Sec. 14, SE 1/4
P-29

PUBLISHED ON MAR 30 APR 06 13 20 1989

SUBSCRIBED AND SWORN TO BEFORE ME THIS 21ST DAY OF APRIL 1989

NOTARY PUBLIC STATE OF UTAH B. T. DAVIS

B. T. Davis
NOTARY PUBLIC

MARCH 1, 1992
COMMISSION EXPIRES
RESIDING IN SALT LAKE COUNTY

LEGAL ADVERTISING INVOICE

ACCOUNT NAME				AD NUMBER	TELEPHONE
CO-OP MINING COMPANY				P-29	801-381-2450
CUST. REF. NO.	SCHEDULE				MISC. CHARGES
ACT/015/025	T MAR 30 APR 06 13 20 1989				.00
CAPTION	SIZE	TIMES	RATE		AD CHARGE
NOTICE OF FILINGAND APPLICAT	31 LINES	4	1.01		125.24

DUE AND PAYABLE ON RECEIPT OF THIS INVOICE
FOR BILLING INFORMATION CALL 801-237-2796

TOTAL AMOUNT DUE 125.24

TO INSURE PROPER CREDIT

PLEASE RETURN THIS PORTION

WITH YOUR PAYMENT IN THE ENCLOSED ENVELOPE
MAKE CHECKS PAYBLE TO:
NEWSPAPER AGENCY CORPORATION
(PLEASE WRITE YOUR ACCOUNT NUMBER ON YOUR CHECK)

BILL TO: CO-OP MINING COMPANY
P.O. BOX 1245
HUNTINGTON UT 84528

ACCOUNT NUMBER	BILLING DATE
LE-3812450	04/21/89
AD NUMBER	PAY THIS AMOUNT
P-29	125.24

072055627100003000000000000012524 183166738211114111111111111123635

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)
ss.
County of Emery,)

I, Dan Stockburger, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for .....Four (4).....consecutive issues, and that the first publication was on the

.....22nd.....day of...June.....,19.93

and that the last publication of such notice was in the issue of said newspaper dated the

13th .....day of.....July.....,19.....93

Dan Stockburger

Subscribed and sworn to before me this

13th .....day of.....July.....,19.....93

Linda L Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $.....64.00.....

Notary Public
LINDA THAYN
211 North 10th East
Price, Utah 84501
My Commission Expires
January 10, 1995
State of Utah

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, hereby announces it's intent to file application to extend mining into the Tank Seam, located above the existing seam within the existing permit area of the Bear Canyon Mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. This includes an additional surface disturbance of approx. 3.5 acres. A copy of the complete application is available for public inspection at the Division of Oil, Gas, and Mining offices, 355 West, North Temple, Suite 350, Salt Lake City, Utah 84180-1203. Written comments on the application should be submitted to the State of Utah, Division of Oil, Gas & Mining, at the above address. The area to be mined can be found on the USGS Hiawatha quadrangle map. The proposed mining and surface disturbance is within privately owned Fee Land. The coal area is described as follows; T16S, R7E SLBM Fee Land, Sec. 14 SW¼, SE¼, Sec. 23 E½, E½, W½, Sec. 24 All West of N-S Bear Canyon Fault, Sec. 25 All West of N-S Bear Canyon Fault, Sec. 26 NE¼ NE¼, NW¼ NE¼ N½, SW¼ NE¼ and access/haul road and topsoil storage area shown on Plate 2-1 of the Mining and Reclamation Plan.

Published in the Emery County Progress June 22, 29 and July 6 and 13, 1993.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)
ss.
County of Carbon,)

I, Dan Stockburger, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the

22nd day of June, 19 93

and that the last publication of such notice was in the issue of such newspaper dated the

13th day of July, 19 93

Dan Stockburger

Subscribed and sworn to before me this

13th day of July, 19 93

Linda Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $ 64.00

Notary Public
LINDA THAYN
811 North 10th East
Price, Utah 84501
My Commission Expires
January 10, 1995
State of Utah

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, hereby announces it's intent to file application to extend mining into the Tank Seam, located above the existing seam within the existing permit area of the Bear Canyon Mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. This includes an additional surface disturbance of approx. 3.5 acres. A copy of the complete application is available for public inspection at the Division of Oil, Gas, and Mining offices, 355 West, North Temple, Suite 350, Salt Lake City, Utah 84180-1203. Written comments on the application should be submitted to the State of Utah, Division of Oil, Gas & Mining, at the above address. The area to be mined can be found on the USGS Hiawatha quadrangle map. The proposed mining and surface disturbance is within privately owned Fee Land. The coal area is described as follows; T16S, R7E SLBM Fee Land, Sec. 14 SW¼, SE¼, Sec. 23 E½, E½, W½, Sec. 24 All West of N-S Bear Canyon Fault, Sec. 25 All West of N-S Bear Canyon Fault, Sec. 26 NE¼ NE¼, NW¼ NE¼ N½, SW¼ NE¼ and access/haul road and topsoil storage area shown on Plate 2-1 of the Mining and Reclamation Plan.

Published in the Sun Advocate June 22, 29 and July 6 and 13, 1993.

143 SOUTH MAIN ST
P.O. BOX 45838
SALT LAKE CITY, UTAH 84145
FED. TAX I.D. # 87-0217663

Newspaper Agency Corporation
The Salt Lake Tribune (NAC) DESERET NEWS

CUSTOMER'S COPY

LEGAL ADVERTISING INVOICE

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	BILLING DATE
CO-OP MINING COMPANY P.O. BOX 1245 HUNTINGTON, UT 84528	LE-3812450	07/06/93
	FOR BILLING INFORMATION CALL (801) 237-2822	

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF NOTICECO-OP MINING COMPANY, P.O. BOX 1245, H FOR CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCURATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON JUN 29 JUL 06 1993

SIGNATURE

DATE 07/06/93

NOTICE
Co-Op Mining Company, P.O. Box 1245, Huntington, Utah hereby announces it's intent to file application to extend mining into the Tank Seam, located above the existing seam within the existing permit area of the Bear Canyon Mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. This includes an additional surface disturbances of approx. 3.5 acres. A copy of the complete application is available for public inspection at the Division of Oil, Gas, and Mining offices, 355 West North Temple, Suite 350, Salt Lake City, Utah 84180-1203. Written comments on the application should be submitted to the State of Utah, Division of Oil, Gas & Mining, at the above address. The area to be mined can be found on the USGS Hiawatha quadrangle map. The proposed mining and surface disturbance is within privately owned Fee Land. The coal area is described as follows: T16S, R7E, SLBM Fee Land, Sec. 14 SW¼, SE¼, Sec. 23 E½, E½ W½, Sec. 24 All West of N-S Bear Canyon Fault, Sec. 25 All West of N-S Bear Canyon Fault, Sec. 26 NE¼, NE¼, NW¼ NE¼, N½ SW¼ NE¼ and access/haul road and topsoil storage area shown on Plate 2-1 of the Mining and Reclamation Plan.
6P820170

ACCOUNT NAME			TELEPHONE
G COMPANY			801-381-2450
SCHEDULE			AD NUMBER
06 1993			6P820170
. NO.	CAPTION		MISC. CHARGES
ON	NOTICECO-OP MINING COMPANY, P.O. BOX 1245, H		.00
IZE	TIMES	RATE	AD CHARGE
1 COLUMN	2	1.16	97.44
LE ON RECEIPT OF THIS INVOICE		TOTAL AMOUNT DUE	97.44

THANK YOU FOR USING LEGAL ADVERTISING.

143 SOUTH MAIN ST.
P.O. BOX 45838
SALT LAKE CITY, UTAH 84145
FED. TAX I.D. # 87-0217663

Newspaper Agency Corporation
The Salt Lake Tribune DESERET NEWS

CUSTOMER'S COPY

LEGAL ADVERTISING INVOICE

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	BILLING DATE
CO-OP MINING COMPANY P.O. BOX 1245 HUNTINGTON, UT 84528	LE-3812450	07/21/93
	FOR BILLING INFORMATION CALL (801) 237-2822	

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF NOTICECO-OP MINING COMPANY, P.O. BOX 1245, H FOR CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCURATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON JUL 21 1993

SIGNATURE

DATE 07/21/93

NOTICE
Co-Op Mining Company, P.O. Box 1245, Huntington, Utah hereby announces it's intent to file application to extend mining into the Tank Seam, located above the existing seam within the existing permit area of the Bear Canyon Mine (ACT/015/025) with the Division of Oil, Gas, and Mining under the laws of the State of Utah. This includes an additional surface disturbances of approx. 3.5 acres. A copy of the complete application is available for public inspection at the Division of Oil, Gas, and Mining offices, 355 West North Temple, Suite 350, Salt Lake City, Utah 84180-1203. Written comments on the application should be submitted to the State of Utah, Division of Oil, Gas & Mining, at the above address. The area to be mined can be found on the USGS Hiawatha quadrangle map. The proposed mining and surface disturbance is within privately owned Fee Land. The coal area is described as follows: T16S, R7E SLBM Fee Land, Sec. 14 SW¼, SE¼, Sec. 23 E½, E½ W½, Sec. 24 All West of N-S Bear Canyon Fault, Sec. 25 All West of N-S Bear Canyon Fault, Sec. 26 NE¼ NE¼, NW¼ NE¼, N½ SW¼ NE¼ and access/haul road and topsoil storage area shown on Plate 2-5 of the Mining and Reclamation Plan.
7K820040

ACCOUNT NAME	TELEPHONE
OMPANY	801-381-2450
SCHEDULE	AD NUMBER
	7K820040

NO.	CAPTION	MISC. CHARGES
	NOTICECO-OP MINING COMPANY, P.O. BOX 1245, H	.00

ZE	TIMES	RATE	AD CHARGE
1 COLUMN	1	.00	.00
E ON RECEIPT OF THIS INVOICE		TOTAL AMOUNT DUE	.00

THANK YOU FOR USING LEGAL ADVERTISING.

143 SOUTH MAIN ST.
P.O. BOX 45838
SALT LAKE CITY, UTAH 84145
FED. TAX I.D. # 87-0217663

Newspaper Agency Corporation

The Salt Lake Tribune (NA) DESERET NEWS

CUSTOMER'S COPY

PROOF OF PUBLICATION

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	
CO-OP MINING CO. P.O. BOX 1245 HIGHWAY 31 HUNTINGTON, UT 84528	C6872450L-07	08/08/95

ACCOUNT NAME	
CO-OP MINING CO.	
TELEPHONE	INVOICE NUMBER
801-687-2450	TL778200501
SCHEDULE	
START 07/11/95 END 08/08/95	
CUST. REF. NO.	
CAPTION	
NOTICECO-OP MINING COMPANY, P.	
SIZE	
40 LINES 1.00 COLUMN	
TIMES	RATE
5	1.16
MISC. CHARGES	AD CHARGES
.00	232.00
	TOTAL COST
	232.00

NOTICE
Co-Op Mining Company, P.O. Box 1245, Huntington, Utah 84528 hereby announces its intent to renew its coal mine and reclamation permit for coal mining activities at the Bear C[illegible] Mine, Permit No. A[illegible]025, issued Nov. 1, 1[illegible]. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area, found on the USGS Hiawatha Quadrangle map, is described as follows: T16S, R7E, SLBM, SW1/4, SE1/4, Sec 14, E1/2, E1/2, W1/2, Sec 23, All Sec. 24 West of N-S Fault, All Sec. 25 West of N-S Fault, NE1/4 NE1/4, NW1/4 NE1/4, N1/2 SW1/4 NE1/4 and access/haul road and topsoil storage area, Sec. 26, as shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conference should be directed to the Utah Division of Oil, Gas & Mining, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203. Copies of the renewal application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah 84513.
7782005O

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF NOTICECO-OP MINING COMPANY, P. FOR CO-OP MINING CO. WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON START 07/11/95 END 08/08/95

SIGNATURE

DATE 08/08/95

NOTARY PUBLIC
[illegible]
143 [illegible]
Salt Lake City, UT 84111
My Commission Expires
April 9, 1998
STATE OF UTAH

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 22nd day of August,1995 and that the last publication of such notice was in the issue of such newspaper dated the 12th day of September, 1995.

Kevin Ashby

Kevin Ashby - Publisher

Subscribed and sworn to before me this 12th day of September,1995.

Linda Thayn

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

Publication fee, $96.00

NOTARY PUBLIC
LINDA THAYN
611 NORTH 10TH EAST
PRICE, UT 84501
My Commission Expires JAN 10, 1999
State of Utah

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to renew its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area, found on the USGS Hiawatha Quadrangle map, is described as follows: T16S, R7E, SLBM, SW1/4, SE1/4, Sec. 14, E1/2, E1/2, W1/2, Sec. 23, All Sec. 24 West of N-S Fault, All Sec. 25 West of N-S Fault, NE1/4, NE1/4, NW1/4, NE1/4, N1/2 SW1/4, NE1/4 and access/haul road and topsoil storage area, Sec. 26, as shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 3 Triad Center, Suite 350, Salt Lake City, Utah, 84180-1203. Copies of the renewal application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress August 22, 29, September 5 and 12, 1995.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 13th day of May,1997 and that the last publication of such notice was in the issue of such newspaper dated the 3rd day of June, 1997.

Kevin Ashby

Kevin Ashby - Publisher

Subscribed and sworn to before me this 3rd day of June,1997.

Linda Thayn

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

Publication fee, $83.20

NOTARY PUBLIC
LINDA THAYN
511 NORTH 10TH EAST
PRICE, UT 84501
My Commission Expires JAN 10, 1999
State of Utah

NOTICE

Co-Op Mining Company, P.O Box 1245, Huntington, Utah, 84528 hereby announces its intent to expand its coal mining activities in the Tank Seam at the Bear Canyon Mine Permit No. ACT/015/025, issued Nov.1, 1985. The Bear Canyon Mine is located in Bear Canyon approximately 12 road miles west of Huntington, Utah. The proposed permit expansion area, found on the USGS Hiawatha Quandrangle map, is described as follows: T16S, R7E, SLBM, W1/4, Sec. 13, NE1/4, Sec. 14, as shown on Plate 2-1 of the Mining and Reclamation Plan. Coal mining activities in this area will involve mining coal from the Tank Seam, Bear Canyon #2 Mine. Any comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801. Copies of the permit application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress May 13, 20, 27 and June 3, 1997.

143 SOUTH MAIN ST.
P.O.BOX 45838
SALT LAKE CITY, UTAH 84145
FED.TAX I.D.# 87-0217663

Newspaper Agency Corporation

The Salt Lake Tribune (NA) DESERET NEWS

CUSTOMER'S COPY

PROOF OF PUBLICATION

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
CO-OP MINING COMPANY ATTN: CHARLES REYNOLDS P.O. BOX 1245 HUNTINGTON, UT 84528	C6872450L-07	06/03/97

ACCOUNT NAME	
CO-OP MINING COMPANY	
TELEPHONE	INVOICE NUMBER
801-687-2450	TL598201771
SCHEDULE	
START 05/13/97 END 06/03/97	
CUST. REF. NO.	
NOTICE	
CAPTION	
NOTICE	
SIZE	
39 LINES 1.00 COLUMN	
TIMES	RATE
4	1.16
MISC. CHARGES	AD CHARGES
.00	180.96
	TOTAL COST
	180.96

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to expand its coal mining activities in the Tank Seam at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 199[illegible] Bear Canyon Mine is lo[illegible] Bear Canyon, approximately 12 road miles west of Huntington, Utah. The proposed permit expansion area, found on the USGS Hiawatha Quadrangle map, is described as follows: T16S, R7E, SLB&M, W1/4, Sec. 13, NE1/4 Sec. 14, as shown on Plate 2-1 of the Mining and Reclamation Plan. Coal mining activities in this area will involve mining coal from the Tank Seam, Bear Canyon #2 Mine. Any comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801. Copies of the permit application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's Office, Emery County Courthouse, Castle Dale, Utah 84513. 5/8/20170

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF NOTICECO-OP MINING COMPANY, P FOR CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON START 05/13/97 END 06/03/97

SIGNATURE Jane Mooney

DATE 06/03/97

NOTARY PUBLIC
JOANNE MOONEY
[illegible] Hunland St.
Salt Lake City, UT 84108
My Commission Expires
March 31, 2000
STATE OF UTAH

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 7th day of December, 1999 and that the last publication of such notice was in the issue of such newspaper dated the 28th day of December, 1999.

Kevin Ashby

Kevin Ashby - Publisher

Subscribed and sworn to before me this 28th day of December, 1999.

Linda Thayn

Notary Public My commission expires January 10, 2003 Residing at Price, Utah

Publication fee, $ 158.40

LINDA THAYN
NOTARY PUBLIC - STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXP. 1-10-2003

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to expand its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is Located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit expansion area, which will include new portals in the Wild Horse Ridge area, consists of 620.26 private acres and 1,338.17 federal acres within Federal Coal Leases U-020668 and U-38727. The area can be found on the USGS Hiawatha Quadrangle map and is described as follows:

T16S, R7E, SLBM	
Section 24	All portions east of north/south fault except NE1/4NE1/4
Section 25	All portions east of the north/south fault
T16S, R8E, SLBM	
Section 19	S1/2NW1/4, SW1/4, SW1/4SE1/4
Section 30	W1/2, W1/2NE1/4, NW1/4SE1/4
Section 31	NE1/4NW1/4, NW1/4NE1/4

The area is shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah, 84114-5801. Copies of the Wild Horse Ridge application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress December 7, 14, 21 and 28, 1999.

143 SOUTH MAIN ST.
P.O.BOX 45838
SALT LAKE CITY, UTAH 84145
FED.TAX I.D.# 87-0217663

Newspaper Agency Corporation

The Salt Lake Tribune (NAC) DESERET NEWS

CUSTOMER'S COPY

PROOF OF PUBLICATION

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
CO-OP MINING COMPANY P. O. BOX 1245 HUNTINGTON UT 84528	CA872450L-07	12/28/99

ACCOUNT NAME	
CO-OP MINING COMPANY	
TELEPHONE	INVOICE NUMBER
435-687-2450	TL8200GNAQ1
SCHEDULE	
START 12/07/99 END 12/28/99	
CUST. REF. NO.	
CAPTION	
NOTICE Co-Op Mining Company,	
SIZE	
58 LINES 1.00 COLUMN	
TIMES	RATE
4	1.16
MISC. CHARGES	AD CHARGES
.00	269.12
	TOTAL COST
	269.12

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah 84528 hereby announces its intent to expand its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit expansion area, which will include new portals in the Wild Horse Ridge area, consists of 620.26 private acres and 1,338.17 federal acres within Federal Coal Leases U-025658 and U-38727. The area can be found on the USGS Hiawatha Quadrangle map and is described as follows:

T.16S, R7E, SLBM
Section 24 All portions east of north/south fault except NE1/4NE1/4
Section 25 All portions east of the north/south fault
T.16S, R8E, SLBM
Section 19 S1/2NW1/4, SW1/4, SW1/4SE1/4
Section 30 W1/2, W1/2NE1/4, NW1/4SE1/4
Section 31 NE1/4NW1/4, NW1/4NE1/4

The area is shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, Salt Lake City, Utah 84114-5801. Copies of the Wild Horse Ridge application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah 84513. 8200GNAQ

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT T
ADVERTISEMENT OF NOTICE Co-Op Mining Company,
CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSP
CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAIL
PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, A
IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON START 12/07/99 END 12/28/99

SIGNATURE Joanne Mooney

DATE 12/28/99

NOTARY PUBLIC
JOANNE MOONEY
2828 Hartford St
Salt Lake City, UT 84106
My Commission Expires
March 31, 2000
STATE OF UTAH

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT.

143 SOUTH MAIN ST.
P.O.BOX 45838
SALT LAKE CITY, UTAH 84145
FED.TAX I.D.# 87-0217663

Newspaper Agency Corporation

The Salt Lake Tribune (NA) DESERET NEWS

CUSTOMER'S COPY

PROOF OF PUBLICATION

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
CO-OP MINING COMPANY P.O. BOX 1245 HUNTINGTON UT 84528	C6872450L-07	08/29/00

ACCOUNT NAME	
CO-OP MINING COMPANY	
TELEPHONE	INVOICE NUMBER
435-687-2450	TL8200SEDL1
SCHEDULE	
START 08/08/00 END 08/29/00	
CUST. REF. NO.	
CAPTION	
NOTICE Co-Op Mining Company,	
SIZE	
43 LINES 1.00 COLUMN	
TIMES	RATE
4	1.16
MISC. CHARGES	AD CHARGES
.00	199.52
	TOTAL COST
	199.52

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to renew its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area, found on the USGS Hiawatha Quadrangle map, is described as follows: T16S, R7E, SLBM, W½ Sec. 13; NE¼SW¼, SE¼ Sec. 14; E½, E½W½ Sec. 23; All Sec. 24 West of N-S Fault; All Sec. 25 West of N-S Fault; NE¼NE¼, NW¼NE¼, N½SW¼NE¼ and access/haul road and topsoil storage area, Sec. 36, as shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, P.O. Box 145801, Salt Lake City, Utah, 84114-5801. Copies of the renewal application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.
8200SEDL

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKKEEPER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF NOTICE Co-Op Mining Company, FOR CO-OP MINING COMPANY WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH.

PUBLISHED ON START 08/08/00 END 08/29/00

SIGNATURE Paine Kong

DATE 08/29/00

NOTARY PUBLIC
JOANNE MOONEY
[illegible] 1st St
Salt Lake City, UT 84109
My Commission Expires
[illegible] 2003
STATE OF UTAH

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 8th day of August, 2000 and that the last publication of such notice was in the issue of such newspaper dated the 29th day of August, 2000.

Kevin Ashby

Kevin Ashby - Publisher

NOTICE

Co-Op Mining Company, P.O. Box 1245, Huntington, Utah 84528 hereby announces its intent to renew its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. ACT/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area, found on the USGS Hiawatha Quadrangle map, is described as follows: T16S, R7E, SLBM, W1/4, Sec. 13; NE1/4SW1/4, SE1/4, Sec. 14; E1/2, E1/2W1/2, Sec. 23; All Sec. 24 West of N-S Fault; All Sec. 25 West of N-S Fault; NE1/4NE1/4, NW1/4NE1/4, N1/2SW1/4NE1/4 and access/haul road and topsoil storage area, Sec. 26, as shown on Plate 2-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conferences should be directed to the Utah Division of Oil, Gas & Mining, 1594 West North Temple, Suite 1210, P.O. Box 145801, Salt Lake City, Utah 84114-5801. Copies of the renewal application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City and at the Emery County Recorder's office, Emery County Courthouse, Castle Dale, Utah 84513.

Published in the Emery County Progress August 8, 15, 22 and 29, 2000.

Subscribed and sworn to before me this 29th day of August, 2000.

Linda Thayn

Notary Public My commission expires January 10, 2003 Residing at Price, Utah

Publication fee, $ 104.00

LINDA THAYN
NOTARY PUBLIC • STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXP. 1-10-2003

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Ken Larson, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 20th day of September, 2005 and that the last publication of such notice was in the issue of such newspaper dated the 11th day of October, 2005.

Ken G. Larson

Ken G Larson - Publisher

Subscribed and sworn to before me this 11th day of October, 2005.

Linda Thayn

Notary Public My commission expires January 10, 2007 Residing at Price, Utah

Publication fee, $ 214.56

LINDA THAYN
NOTARY PUBLIC • STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXPIRES 1-10-2007

NOTICE

Co-Op Mining Company, P. O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to renew its coal mine and reclamation permit for coal mining activities at the Bear Canyon Mine, Permit No. C/015/005, issued Nov. 1, 1995. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area, found on the USGS Hiawatha Quadrangle map, is described as follows:

T16S R7E	Sec 13: W1/4
	Sec 14: S1/2,NE1/4
	Sec 23: E1/2,E1/2W1/2
	Sec 24: all except the NE1/4NE1/4
	Sec 25: All
	Sec 26: N1/2NE1/4, N1/2SW1/4NE1/4 and the access/haul road as shown on Plate 2-1 of the Bear Canyon Mining and Reclamation Plan.
T16S R8E	Section 19: S1/2NW1/4, SW1/4, SW1/4SE1/4
	Section 30: W1/2, W1/2NE1/4, NW1/4SE1/4
	Section 31: NE1/4NW1/4, NW1/4NE1/4

Written comments, objections, or requests for informal conference should be directed to the Utah Division of Oil, Gas, & Mining, P. O. Box 145801, Salt Lake City, Utah, 84114-5801. Copies of the of the renewal application are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City, and at the Emery County Recorders office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress September 20, 27, October 4 and 11, 2005.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Emery,)

I, Richard Shaw, on oath, say that I am the General Manager of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached. was published in the full issue of such newspaper for 4 (Four) consecutive issues, and that the first publication was on the 18th day of October, 2005 and that the last publication of such notice was in the issue of such newspaper dated the 8th day of November, 2005.

Richard Shaw - General Manager

Subscribed and sworn to before me this 8th day of November, 2005.

Notary Public My commission expires January 10, 2007 Residing at Price, Utah

Publication fee, $238.40

LINDA THAYN
NOTARY PUBLIC • STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXPIRES 1-10-2007

NOTICE

Co-Op Mining Company, P. O. Box 1245, Huntington, Utah, 84528 hereby announces its intent to expand underground coal mining activities at the Bear Canyon Mine, Permit No. C/015/025, issued Nov. 1, 1985. The Bear Canyon Mine is located in Bear Canyon, approximately 12 road miles west of Huntington, Utah. The permit area addition will consist of 2,740.00 private acres and 4,764.36 federal acres within Federal Coal Leases U-024316, U-46484, U-61048, and U-61049. The expansion area can be found on the USGS Hiawatha Quadrangle map and is described as follows:

T16S R7E	Section 01:	E1/2
	Section 10:	All except the SW1/4SW1/4
	Section 11:	All
	Section 12:	All
	Section 13:	E1/2, E1/2W1/2
	Section 14:	E1/2NW1/4
T16S R8E	Section 06:	S1/2NW1/4; SW1/4, S1/2SE1/4,W1/2N1/2SE1/4
	Section 07:	All
	Section 08:	W1/2, W1/2E1/2
	Section 16:	All
	Section 17:	All
	Section 18:	All
	Section 19:	N1/2NW1/4, NE1/4, N1/2SE1/4
	Section 20:	N1/2, N1/2 SW1/4, NE1/4SE1/4
	Section 21:	All except the SW1/4SW1/4

The area is shown on Plate 1-1 of the Mining and Reclamation Plan. Written comments, objections, or requests for informal conference should be directed to the Utah Division of Oil, Gas, & Mining. 1594 West, North Temple, Suite 1210, Salt Lake City, Utah, 84114-5801. Copies of the of the application and the current mining plan are available for public inspection at the office of the Utah Division of Oil, Gas & Mining, Salt Lake City, and at the Emery Count Recorder's office, Emery County Courthouse, Castle Dale, Utah, 84513.

Published in the Emery County Progress October 18, 25, November 1 and 8, 2005.

APPENDIX 1-E

FEDERAL LEASE

IN REPLY REFER TO
3453
U-024316
U-024318
(U-942)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
UTAH STATE OFFICE
136 E. SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

AUG 21 1980

CERTIFIED MAIL

DECISION

C.O.P. Coal Development Company	:	Coal
53 West Angelo Avenue	:	U-024316
Salt Lake City, Utah 84115	:	U-024318
	:	

Assignments Approved
Bond Accepted

On April 25, 1980, Assignments of Coal leases U-024316 and U-024318, entered into on April 1, 1980 between Peabody Coal Company, as assignor, and C.O.P. Coal Development Company, as assignee, were filed in this office.

Satisfactory evidence of the qualifications and holdings of C.O.P. Coal Development Company has been filed and the lease accounts are in good standing. The assignments appear to meet the requirements of the regulations and are hereby approved effective September 1, 1980. Approval of the assignments does not constitute approval of any of the terms therein which may be in violation of the lease terms.

As required by the regulations in 43 CFR 3472.2(a), a Personal Bond and Power of Attorney, secured by $5,000 cash, was filed in this office on August 20, 1980, for each coal lease. The bonds are satisfactory and are accepted effective August 20, 1980.

L. Felix

Chief, Minerals Section

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE READJUSTMENT

Serial Number U-024316

Lease Date May 1, 1958

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

C. O. P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, UT 84115

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

|XX| Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

|____| Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec. 13, W½W½;
Sec. 14, NE¼, E½NW¼.

containing 400.00 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports,and carrying out mitigating measures shall be borne by the lessee.

6. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

7. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

11. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

12. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

13. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

14. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

15. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

16. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

17. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

18. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.)

their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the manual of surveying instruction, U.S. Department of Interior.

19. The lessee at his expense will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

20. The lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE READJUSTMENT

Serial Number U-024318

Lease Date May 1, 1958

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

C. O. P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, UT 84115

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

[XX] Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

[ ] Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec., 26, E½NW¼.

containing 80.00 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

The following stipulations made part of this lease may be waived or amended with the mutual consent of the lessor and lessee.

1. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this act and are subject to compliance with Office of Surface Mining regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

2. The permitting of any mining operations on the lease will be subject to the possible designation of any portion of the lease as unsuitable for some or all kinds of surface mining under the regulations of the Department under the Surface Mining Control and Reclamation Act of 1977 (SMCRA) in effect at the time of action on the mine plan permit.

3. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists and a report prepared

itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural resources.

If significant cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the authorized officer who shall evaluate or have evaluated such discoveries and, within 5 working days, shall notify the Lessee what action shall be taken with respect to such discoveries.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee.

4. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a paleontological appraisal of the areas to be disturbed. The appraisal shall be conducted by qualified paleontologists and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified paleontological resources.

If paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the authorized officer who shall evaluate or have evaluated such discoveries brought to his attention and, within 5 working days, shall notify the lessee what action shall be taken with respect to such discoveries. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee. The cost of salvage of paleontological remains (fossils) shall be borne by the United States.

5. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory species of high Federal interest occur in the area, the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. A listing of migratory birds of high Federal interest in Federal coal producing regions is published by the Fish and Wildlife Service, Migratory Bird Management Office, Washington, D.C. The inventory shall be conducted by qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee.

6. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

7. Powerlines on the lease area used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

8. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities on the lease area. The migration of road surfacing and subsurface materials into streams and water courses shall be prevented.

9. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

10. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: 1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, 2) cause damage to existing surface structures, and 3) damage or alter the flow of perennial streams.

11. In order to avoid surface disturbance on steep canyon slopes and to satisfy the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

12. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

Bureau of Land Management
Utah State Office
324 South State, Suite 301
Salt Lake City, Utah 84111-2303

3451
U-020668
~~U-38727~~
(U-942)

FEB 9 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

SR/PR Rec'd FEB 12 1988

	DECISION	
Nevada Electric Investment Co.	:	Coal Leases
P. O. Box 320	:	U-020668 and
Las Vegas, NV 89151	:	U-38727

Leases Readjusted Effective May 1, 1988

On October 30, 1987, Nevada Electric Investment Company was sent a Notice of Proposed Readjustment of Leases in connection with coal leases U-020668 and U-38727. No objections to the terms as stated were filed within the 60 day period allowed. Therefore, coal leases U-020668 and U-38727 are readjusted effective May 1, 1988 as stipulated in the decision and Coal Lease Readjustments.

The new rental and royalty rates will be effective simultaneously with the effective date of the readjustments.

Lease bonds in the amount of $5,000 for each of the subject leases are currently on file. These bonds are conditioned upon compliance with all the terms and conditions of the coal leases. It has been determined that these bonds are presently adequate coverage for these leases.

ROBERT [illegible]

Chief, Minerals
Adjudication Section

Enclosure
Coal Lease Readjustments

cc: Resource Development Committee w/encl.
Solid Minerals w/encl.
USFS, Ogden w/encl.
MMS, AFS, Denver w/encl.
Moab District w/encl.

cc: SRA
SLMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE READJUSTMENT

Serial Number U-020668

Lease Date May 1, 1958

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

Nevada Electric Investment Company
P. O. Box 230
Las Vegas, NV 89151

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

|XX| Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

|___| Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec. 25, SE¼NE¼, NE¼SE¼.
T. 16 S., R. 8 E., SLM, Utah
Sec. 30, lots 1-4, W½NE¼, E½W½, NW¼SE¼;
Sec. 31, NW¼NE¼, NE¼NW¼.

containing 626.32 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports,and carrying out mitigating measures shall be borne by the lessee.

6. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

7. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

11. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

12. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

13. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

14. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

15. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

16. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

17. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

18. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the

requirements of the rectangular surveying system. This work shall be conducted at the expense of the lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the manual of surveying instruction, U.S. Department of Interior.

19. The lessee at his expense will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

20. The lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155

In Reply Refer To:
3432
UTU-38727
(UT-924)

JUN 19 2002

DECISION

C.O.P. Coal Development Company	:	Coal Lease
53 West Angelo Avenue	:	UTU-38727
Salt Lake City, Utah 84115	:	

Coal Lease UTU-38727 Modified

Coal lease UTU-38727 was modified effective June 19, 2002. All terms and conditions of the original lease were made consistent with the laws, regulations, and lease terms applicable at the time of this modification.

Additional rental of $110.00 to cover the estimated additional rental for the current rental year was submitted June 17, 2002. Rental in the amount of $3.00 per acre, or a total of $2,343 is due on May 1, 2003.

Within 30 days after the effective date of this lease modification, the lessee shall amend its Bear Canyon Logical Mining Unit application to include the 40.00 acres added to coal lease UTU-38727 by this modification. The modified land shall be segregated into another Federal coal lease should the lessee fail to file such amendment.

Robert Lopez
Chief, Branch of
Minerals Adjudication

Enclosures:
1. Copy of Modified Lease (12 pp)

cc: MMS, Solids (w/copy of modification)
Resource Development Coordinating Committee (w/copy of modification)
Price Coal Office (Attn: Steve Falk) (w/copy of modification)
Manti-LaSal National Forest (w/copy of modification)
Lowell Braxton, Director, UDOGM, Box 145801, SLC, UT 84114 (w/copy of modification)
SITLA, Attn: John Blake (w/copy of modification)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial No. UTU-38727

MODIFIED COAL LEASE

Date of Lease: May 1, 1958

PART I.

THIS MODIFIED COAL LEASE is entered into on JUN 1 9 2002, by and between the **UNITED STATES OF AMERICA**, hereinafter called the Lessor, through the Bureau of Land Management, and

C.O.P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, Utah 84115

hereinafter called Lessee.

This modified lease shall retain the effective date of May 1, 1958, of the original **COAL LEASE UTU-38727**, and is effective for a period of 20 years therefrom, and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year (May 1, 1978), and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the: (NOTE: Check the appropriate Act or Acts.)

XX Mineral Lands Leasing Act of 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

_ Mineral Leasing Act for Acquired Lands of 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessee as the holder of Coal Lease UTU-38727, issued effective May 1, 1958, was granted the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 1.

The Lessor in consideration of fair market value, rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to Lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 2.

Tract 1: T. 16 S., R. 7 E., SLM, UT
Sec. 24, SENE, E2SE;
Sec. 25, N2NE,SWNE,SWNW, NWSW,W2SE,SESE.

T. 16 S., R. 8 E., SLM, UT
Sec. 19, lots 2-4,SENW, E2SW, SWSE.

Tract 2: T. 16 S., R. 7 E., SLM, UT
Sec. 24, NENE.

Containing 780.39 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

Part II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay Lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 per acre for each lease year.

(b) **RENTAL CREDITS** - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 8 percent of the value of the coal as set forth in the regulations. Royalties are due to Lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) **ADVANCE ROYALTIES** - Upon request by the Lessee, the authorized officer may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the Lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is held by inclusion in an amendment to the Bear Canyon LMU.

The Lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. **LOGICAL MINING UNIT (LMU)** - The lands contained in the original lease have been included in the Bear Canyon LMU application UTU-73342 filed April 20, 1990. Within 30 days after the effective date of this lease modification, the Lessee shall amend its application for the Bear Canyon Logical Mining Unit to include the 40.00 acres added to Coal Lease UTU-38727 by this modification. The modified land shall be segregated into another Federal coal lease should the Lessee fail to file such an amendment.

The stipulations established in an LMU approval in effect at the time of LMU approval or modification will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as Lessor may prescribe, Lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of Lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow Lessor access to and copying of documents reasonably necessary to verify Lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Action (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an

approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by Lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specifications of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of Lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8 **PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY** - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergences; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither Lessee nor Lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) **TRANSFERS**
(Check the appropriate space)

X This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

___ This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

___ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest <u>must</u> be approved in accordance with the regulations.

(b) **RELINQUISHMENTS** - The Lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon Lessor's acceptance of the relinquishment, Lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. **DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC.** - At such times as all portions of this lease are returned to Lessor, Lessee shall deliver up to Lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, Lessee shall remove from the premises all

other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the Lessor, but Lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the Lessor. If the surface is owned by third parties, Lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by Lessee's activity or activities incidental thereto, and reclaim access roads or trail.

Sec. 11. **PROCEEDINGS IN CASE OF DEFAULT** - If Lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the Lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by Lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. **HEIRS AND SUCCESSORS - IN-INTEREST** - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall insure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. **INDEMNIFICATION** - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the Lessee's activities and operations under this lease.

Sec. 14. **SPECIAL STATUTES** - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

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Sec. 15. **SPECIAL STIPULATIONS -**

SEE ATTACHED STIPULATIONS

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SPECIAL STIPULATIONS FOR MODIFIED COAL LEASE U-38727

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

6. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

7. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

11. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

12. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

13. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, or (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

14. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

15. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

16. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

17. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

18. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

19. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

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20. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

21. The Lessee, at his expense, will be responsible to replace any surface and/or developed ground water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

22. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

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23. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (I) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the AO to leave such reserves unmined. Upon approval by the AO, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2 as approved will not attain MER as the result of changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the MMS demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

24. WASTE CERTIFICATION: The lessee shall provide upon abandonment and/or sealing off a mined area and prior to lease termination/relinquishment, certification to the lessor that, based upon a complete search of all the operator's records for the mine and upon their knowledge of past operations, there has been no **hazardous substances** per (40 CFR 302.4) or **used oil** as per Utah State Management Rule R-315-15, deposited within the lease, either on the surface or underground, or that all remedial action necessary has been taken to protect human health and the environment with respect to any such substances remaining on the property. The back-up documentation to be provided shall be described by the lessor prior to the first certification and shall include all documentation applicable to the Emergency Planning and Community Right-to-know Act (EPCRA, Public Law 99-499), Title III of the Superfund Amendments and Reauthorization Act of 1986 or equivalent.

25. UNDERGROUND INSPECTION: All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to the sealing of any areas in the mine and state the reason for closure. Prior to seals being put into place, the lessee shall inspect the area and document any equipment/machinery, hazardous substances, and used oil that is to be left underground. The Authorized Officer may participate in this inspection. The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120(h) and State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries etc.) that is proposed to be left underground. In addition, these items will be photographed at the lessee's expense and shall be submitted to the Authorized Officer as part of the certification. The abandonment of any equipment/machinery shall be on a case by case basis and shall not be accomplished unless the Authorized Officer has granted a written approval. Any on-lease disposal of non-coal waste must comply with 30 CFR § 817.89.

26. Due to the uncertainty of the amount of recoverable coal tons in this modification and the uncertainty in mining conditions, the lessee will pay the fair market value (FMV) for the coal resources mined in the area of Federal Coal Lease Modification (U-38727) at the rate of $0.25 per ton for the actual tonnage mined. Payment of FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Minerals Management Service (MMS). The lessee will clearly indicate which portion of the payment is for royalty and what is for lease bonus payment.

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The United States of America

C.O.P. COAL DEVELOPMENT COMPANY
Company or Lessee Name

(Signature of Lessee)

PRESIDENT
(Title)

6-8-2002
(Date)

Bureau of Land Management
Utah State Office

By

(Signing Officer)

Chief, Branch of
Minerals Adjudication
Title)

JUN 19 2002
(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

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SALT LAKE DISTRICT OFFICE
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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155

In Reply Refer To:
3432
UTU-38727
(UT-924)

JUN 19 2002

DECISION

C.O.P. Coal Development Company	:	Coal Lease
53 West Angelo Avenue	:	UTU-38727
Salt Lake City, Utah 84115	:	

Coal Lease UTU-38727 Modified

Coal lease UTU-38727 was modified effective June 19, 2002. All terms and conditions of the original lease were made consistent with the laws, regulations, and lease terms applicable at the time of this modification.

Additional rental of $110.00 to cover the estimated additional rental for the current rental year was submitted June 17, 2002. Rental in the amount of $3.00 per acre, or a total of $2,343 is due on May 1, 2003.

Within 30 days after the effective date of this lease modification, the lessee shall amend its Bear Canyon Logical Mining Unit application to include the 40.00 acres added to coal lease UTU-38727 by this modification. The modified land shall be segregated into another Federal coal lease should the lessee fail to file such amendment.

Robert Lopez
Chief, Branch of
Minerals Adjudication

Enclosures:
1. Copy of Modified Lease (12 pp)

cc: MMS, Solids (w/copy of modification)
Resource Development Coordinating Committee (w/copy of modification)
Price Coal Office (Attn: Steve Falk) (w/copy of modification)
Manti-LaSal National Forest (w/copy of modification)
Lowell Braxton, Director, UDOGM, Box 145801, SLC, UT 84114 (w/copy of modification)
SITLA, Attn: John Blake (w/copy of modification)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial No. UTU-38727

MODIFIED COAL LEASE

Date of Lease: May 1, 1958

PART I.

THIS MODIFIED COAL LEASE is entered into on JUN 19 2002, by and between the **UNITED STATES OF AMERICA**, hereinafter called the Lessor, through the Bureau of Land Management, and

C.O.P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, Utah 84115

hereinafter called Lessee.

This modified lease shall retain the effective date of May 1, 1958, of the original **COAL LEASE UTU-38727**, and is effective for a period of 20 years therefrom, and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year (May 1, 1978), and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the: (NOTE: Check the appropriate Act or Acts.)

XX Mineral Lands Leasing Act of 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

_ Mineral Leasing Act for Acquired Lands of 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessee as the holder of Coal Lease UTU-38727, issued effective May 1, 1958, was granted the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 1.

The Lessor in consideration of fair market value, rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to Lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 2.

Tract 1: T. 16 S., R. 7 E., SLM, UT
Sec. 24, SENE, E2SE;
Sec. 25, N2NE,SWNE,SWNW,
NWSW,W2SE,SESE.
T. 16 S., R. 8 E., SLM, UT
Sec. 19, lots 2-4,SENW, E2SW, SWSE.

Tract 2: T. 16 S., R. 7 E., SLM, UT
Sec. 24, NENE.

ntaining 780.39 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

Part II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay Lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 per acre for each lease year.

(b) **RENTAL CREDITS** - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 8 percent of the value of the coal as set forth in the regulations. Royalties are due to Lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) **ADVANCE ROYALTIES** - Upon request by the Lessee, the authorized officer may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the Lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is held by inclusion in an amendment to the Bear Canyon LMU.

The Lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. **LOGICAL MINING UNIT (LMU)** - The lands contained in the original lease have been included in the Bear Canyon LMU application UTU-73342 filed April 20, 1990. Within 30 days after the effective date of this lease modification, the Lessee shall amend its application for the Bear Canyon Logical Mining Unit to include the 40.00 acres added to Coal Lease UTU-38727 by this modification. The modified land shall be segregated into another Federal coal lease should the Lessee fail to file such an amendment.

The stipulations established in an LMU approval in effect at the time of LMU approval or modification will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as Lessor may prescribe, Lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of Lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow Lessor access to and copying of documents reasonably necessary to verify Lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Action (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an

approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by Lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specifications of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of Lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8 **PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY** - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergences; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither Lessee nor Lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) **TRANSFERS**
(Check the appropriate space)

X This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

___ This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

___ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) **RELINQUISHMENTS** - The Lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon Lessor's acceptance of the relinquishment, Lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. **DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC.** - At such times as all portions of this lease are returned to Lessor, Lessee shall deliver up to Lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, Lessee shall remove from the premises all

other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the Lessor, but Lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the Lessor. If the surface is owned by third parties, Lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by Lessee's activity or activities incidental thereto, and reclaim access roads or trail.

Sec. 11. **PROCEEDINGS IN CASE OF DEFAULT** - If Lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the Lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by Lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. **HEIRS AND SUCCESSORS - IN-INTEREST** - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall insure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. **INDEMNIFICATION** - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the Lessee's activities and operations under this lease.

Sec. 14. **SPECIAL STATUTES** - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

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Sec. 15. **SPECIAL STIPULATIONS -**

SEE ATTACHED STIPULATIONS

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SPECIAL STIPULATIONS FOR MODIFIED COAL LEASE U-38727

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

6. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

7. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

11. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

12. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

13. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, or (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

14. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

15. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

16. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

17. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

18. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

19. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

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20. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

21. The Lessee, at his expense, will be responsible to replace any surface and/or developed ground water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

22. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

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23. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (I) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

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DEPARTMENT OF THE INTERIOR
BUR OF LAND MGMT

The United States of America

Bureau of Land Management
Utah State Office

C.O.P. COAL DEVELOPMENT COMPANY
Company or Lessee Name

J.D. Knighton
(Signature of Lessee)

PRESIDENT
(Title)

6-8-2002
(Date)

By

(Signing Officer)

Chief, Branch of
Minerals Adjudication
Title)

JUN 19 2002
(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

STATE OFFICE
RECEIVED
UTAH
JUN 17 PM 2:08
BUREAU OF LAND MGMT

Bureau of Land Management
Utah State Office
324 South State, Suite 301
Salt Lake City, Utah 84111-2303

3451
U-46484
(U-942)

SR/PR FEB 29 1988

FEB 11 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

DECISION

Nevada Electric Investment Company P. O. Box 320 Las Vegas, NV 89151	:	Coal Lease U-46484

Lease Readjusted Effective May 1, 1988

On October 16, 1987, Nevada Electric Investment Company was sent a Notice of Proposed Readjustment of Lease in connection with U-46484. The land description in Section 2 of the readjusted lease form is corrected to read:

Sec. 10, N½, N½S½, SE¼SW¼, S½SE¼.
Sec. 11, all;
Sec. 12, W½W½.

The only other objection stated was in regard to the number of tons of recoverable reserves contained on coal lease U-46484. As explained in our letter dated December 16, 1987, the coal reserve estimates are subject to change based on new data at any time within the ten year period following readjustment; therefore, coal lease U-46484 is readjusted effective May 1, 1988 as stipulated in the decision and Coal Lease Readjustment.

The new rental and royalty rate will be effective simultaneously with the effective date of the readjustment.

A lease bond in the amount of $5,000 is currently on file. This bond is conditioned upon compliance with all the terms and conditions of this coal lease and is determined to be adequate coverage at this time.

ROBERT LOPEZ
Chief, Minerals
Adjudication Section

Enclosure
Coal Lease Readjustment

cc: Resource Development Coordinating Committee w/encl.

Solid Minerals (U-921) w/encl.
USFS, Ogden, UT w/encl.
MMS, AFS, Denver, CO w/encl.
Moab District w/encl.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number U-46484

Lease Date May 1, 1958

COAL LEASE READJUSTMENT

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

Nevada Electric Investment Company
P. O. Box 230
Las Vegas, NV 89151

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

[XX] Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

[ ] Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec. 10, N½, N½S½, SE¼SW¼, S½SE¼;
Sec. 11, all;
Sec. 12, W½W½.

containing 1,400.00 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports,and carrying out mitigating measures shall be borne by the lessee.

6. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

7. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

11. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

12. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

13. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

14. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

15. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

16. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

17. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

18. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the manual of surveying instruction, U.S. Department of Interior.

19. The lessee at his expense will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

20. The lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

Attn: [illegible]

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155

In Reply Refer To:
3451
U-61048
(UT-932)

FEB 1 2001

CERTIFIED MAIL--Return Receipt Requested

NOTICE

C.O.P. Coal Development Company 53 West Angelo Avenue Salt Lake City, Utah 84115	:	Coal Lease U-61048

Lease Terms and Conditions to be Readjusted

Coal lease U-61048 was issued effective February 8, 1923, and the terms and conditions of the lease become subject to readjustment on February 8, 2003.

Notice is hereby given that the lease terms and conditions will be readjusted under the provisions of 43 CFR 3451.

As required by the regulations at 43 CFR 3451.1(c)(2), a decision containing the readjusted terms and conditions will be forwarded to you no later than February 8, 2003.

Robert Lopez
Chief, Branch of
Minerals Adjudication

cc: Resource Development Coordinating Committee
Price Coal Office (Attn: Jay Marshall)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155

In Reply Refer To:
3432
UTU-61049
(UT-924)

JUN 19 2002

DECISION

C.O.P. Coal Development Company	:	Coal Lease
53 West Angelo Avenue	:	UTU-61049
Salt Lake City, Utah 84115	:	

Coal Lease UTU-61049 Modified

Coal lease UTU-61049 was modified effective June 19, 2002. All terms and conditions of the original lease were made consistent with the laws, regulations, and lease terms applicable at the time of this modification.

Additional rental of $200.00 to cover the estimated additional rental for the current rental year was submitted June 17, 2002. Rental in the amount of $3.00 per acre, or a total of $6,591 is due on November 1, 2002.

Within 30 days after the effective date of this lease modification, the lessee shall amend its Bear Canyon Logical Mining Unit application to include the 160.00 acres added to coal lease UTU-61049 by this modification. The modified land shall be segregated into another Federal coal lease should the lessee fail to file such amendment.

Robert Lopez
Chief, Branch of
Minerals Adjudication

Enclosures:
1. Copy of Modified Lease (12 pp)

cc: MMS, Solids (w/copy of modification)
Resource Development Coordinating Committee (w/copy of modification)
Price Coal Office (Attn: Steve Falk) (w/copy of modification)
Manti-LaSal National Forest (w/copy of modification)
Lowell Braxton, Director, UDOGM, Box 145801, SLC, UT 84114 (w/copy of modification)
SITLA, Attn: John Blake (w/copy of modification)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial No. UTU-61049

MODIFIED COAL LEASE

Date of Lease: November 1, 1949

PART I.

THIS MODIFIED COAL LEASE is entered into on JUN 1 9 2002, by and between the **UNITED STATES OF AMERICA**, hereinafter called the Lessor, through the Bureau of Land Management, and

C.O.P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, Utah 84115

hereinafter called Lessee.

This modified lease shall retain the effective date of November 1, 1949, of the original **COAL LEASE UTU-61049**, and is effective for a period of 20 years therefrom, and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year (November 1, 1969), and each 10-year period thereafter.

Sec. 1. This lease is issued pursuant and subject to the terms and provisions of the: (NOTE: Check the appropriate Act or Acts.)

XX Mineral Lands Leasing Act of 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

_ Mineral Leasing Act for Acquired Lands of 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessee as the holder of Coal Lease UTU-61049, issued effective November 1, 1949, was granted the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 1.

The Lessor in consideration of fair market value, rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to Lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the lands described below as Tract 2.

Tract 1: T. 16 S., R. 7 E., SLM, UT
Sec. 1, lot 2, SWNE,W2SE;
Sec. 12, W2NE,E2W2,SE;
Sec. 13, E2, E2W2.

T. 16 S., R. 8 E., SLM, UT
Sec. 7, lots 3,4,E2SW;
Sec. 18, lots 1-4,E2,E2W2;
Sec. 19, SWNE, NWSE;
Sec. 20, SENW, NESW.

Tract 2: T. 16 S., R. 8 E., SLM, UT
Sec. 19, SENE, NESE;
Sec. 20, SWNW, NWSW.

Containing 2196.09 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

Part II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay Lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 per acre for each lease year.

(b) **RENTAL CREDITS** - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 8 percent of the value of the coal as set forth in the regulations. Royalties are due to Lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) **ADVANCE ROYALTIES** - Upon request by the Lessee, the authorized officer may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the Lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $7,000. The authorized officer may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is held by inclusion in an amendment to the Bear Canyon LMU.

The Lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. **LOGICAL MINING UNIT (LMU)** - The lands contained in the original lease have been included in the Bear Canyon LMU application UTU-73342 filed April 20, 1990. Within 30 days after the effective date of this lease modification, the Lessee shall amend its application for the Bear Canyon Logical Mining Unit to include the 160.00 acres added to Coal Lease UTU-61049 by this modification. The modified land shall be segregated into another Federal coal lease should the Lessee fail to file such an amendment.

The stipulations established in an LMU approval in effect at the time of LMU approval or modification will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as Lessor may prescribe, Lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all reasonable times for the inspection of any duly authorized officer of Lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow Lessor access to and copying of documents reasonably necessary to verify Lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Action (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an

approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by Lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specifications of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of Lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8 **PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY** - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergences; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither Lessee nor Lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) **TRANSFERS**
(Check the appropriate space)

X This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.

___ This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

___ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) **RELINQUISHMENTS** - The Lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon Lessor's acceptance of the relinquishment, Lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. **DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC.** - At such times as all portions of this lease are returned to Lessor, Lessee shall deliver up to Lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, Lessee shall remove from the premises all

other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the Lessor, but Lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the Lessor. If the surface is owned by third parties, Lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by Lessee's activity or activities incidental thereto, and reclaim access roads or trail.

Sec. 11. **PROCEEDINGS IN CASE OF DEFAULT** - If Lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the Lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by Lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Sec. 12. **HEIRS AND SUCCESSORS - IN-INTEREST** - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall insure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. **INDEMNIFICATION** - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the Lessee's activities and operations under this lease.

Sec. 14. **SPECIAL STATUTES** - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

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Sec. 15. **SPECIAL STIPULATIONS -**

SEE ATTACHED STIPULATIONS

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SPECIAL STIPULATIONS FOR MODIFIED COAL LEASE U-61049

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

6. If there is reason to believe that Threatened or Endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area, the Lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the Lessee.

7. The Lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data are adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the interrelationship of the geology, topography, surface and ground water hydrology, vegetation and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

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11. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

12. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

13. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, or (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

14. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

15. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

16. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

17. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

18. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

19. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

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20. The Lessee at the conclusion of the mining operation, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the Lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the Manual of Surveying Instructions, U.S. Department of Interior.

21. The Lessee, at his expense, will be responsible to replace any surface and/or developed ground water sources identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses (authorized by 36 CFR 251).

22. The Licensee/Permittee/Lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the license/permit/lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

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23. Notwithstanding the approval of a resource recovery and protection plan by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (I) the operator/lessee fails to achieve maximum economic recovery [as defined at 43 CFR §3480.0-5(21)] of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unminable by the operation, the operator shall submit appropriate justification to obtain approval by the AO to leave such reserves unmined. Upon approval by the AO, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or a portion of the lease as authorized by statute and regulation.

In the event the AO determines that the R2P2 as approved will not attain MER as the result of changed conditions, the AO will give proper notice to the operator/lessee as required under applicable regulations. The AO will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the AO that the coal reserves have been rendered unminable or at such time that the lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the MMS demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

24. WASTE CERTIFICATION: The lessee shall provide upon abandonment and/or sealing off a mined area and prior to lease termination/relinquishment, certification to the lessor that, based upon a complete search of all the operator's records for the mine and upon their knowledge of past operations, there has been no **hazardous substances** per (40 CFR 302.4) or **used oil** as per Utah State Management Rule R-315-15, deposited within the lease, either on the surface or underground, or that all remedial action necessary has been taken to protect human health and the environment with respect to any such substances remaining on the property. The back-up documentation to be provided shall be described by the lessor prior to the first certification and shall include all documentation applicable to the Emergency Planning and Community Right-to-know Act (EPCRA, Public Law 99-499), Title III of the Superfund Amendments and Reauthorization Act of 1986 or equivalent.

25. UNDERGROUND INSPECTION: All safe and accessible areas shall be inspected prior to being sealed. The lessee shall notify the Authorized Officer in writing 30 days prior to the sealing of any areas in the mine and state the reason for closure. Prior to seals being put into place, the lessee shall inspect the area and document any equipment/machinery, hazardous substances, and used oil that is to be left underground. The Authorized Officer may participate in this inspection. The purpose of this inspection will be: (1) to provide documentation for compliance with 42 U.S.C. 9620 section 120(h) and State Management Rule R-315-15, and to assure that certification will be meaningful at the time of lease relinquishment, (2) to document the inspection with a mine map showing location of equipment/machinery (model, type of fluid, amount remaining, batteries etc.) that is proposed to be left underground. In addition, these items will be photographed at the lessee's expense and shall be submitted to the Authorized Officer as part of the certification. The abandonment of any equipment/machinery shall be on a case by case basis and shall not be accomplished unless the Authorized Officer has granted a written approval. Any on-lease disposal of non-coal waste must comply with 30 CFR § 817.89.

26. Due to the uncertainty of the amount of recoverable coal tons in this modification and the uncertainty in mining conditions, the lessee will pay the fair market value (FMV) for the coal resources mined in the area of Federal Coal Lease Modification (U-61049) at the rate of $0.25 per ton for the actual tonnage mined. Payment of FMV at the specified rate and tonnage mined will be on the schedule required for payment of production royalties to the Minerals Management Service (MMS). The lessee will clearly indicate which portion of the payment is for royalty and what is for lease bonus payment.

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The United States of America

C.O.P. COAL DEVELOPMENT COMPANY
Company or Lessee Name

(Signature of Lessee)

PRESIDENT
(Title)

6-8-2002
(Date)

Bureau of Land Management
By Utah State Office

(Signing Officer)
Chief, Branch of
Minerals Adjudication
Title)

JUN 1 9 2002
(Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

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APPENDIX 1-F

WAIVER LETERS

Salt Lake City, Utah 84115
July 2, 1991

To Whcm it May Concern:

C.O.P. Coal Development Company, as the owner of a dwelling within 300 feet of the mining and reclamation operations of Co-op Mining Company at Bear Canyon, Utah, which dwelling is occupied by Kenny Defa and family, is aware of its legal right to deny mining within 300 feet of the dwelling and has knowingly waived that right and consented to the mining and reclamation acitivities of Co-op Mining Company at Bear Canyon, Utah.

C.O.P. Coal Development Co.

By _____

Kenny Defa, as occupant of the dwelling above described, hereby waives any right he may have to the mining and reclamation activities of Co-op Mining Company within 300 feet of said dwelling and expressly consents to the same.

_____
Kenny Defa

Salt Lake City, Utah 84115
July 2, 1991

To Whom it May Concern:

C.O.P. Coal Development Company, as the owner of a dwelling within 300 feet of the mining and reclamation operations of Co-op Mining Company at Bear Canyon, Utah, which dwelling is occupied by Wendell Owen and family, is aware of its legal right to deny mining within 300 feet of the dwelling and has knowingly waived that right and consented to the mining and reclamation activities of Co-op Mining Company at Bear Canyon, Utah.

C.O.P. Coal Development Co.

By_____

Wendell Owen, as occupant of the dwelling above described, hereby waives any right he may have to the mining and reclamation activities of Co-op Mining Company within 300 feet of said dwelling and expressly consents to the same.

Wendell Owen

Wendell Owen

Salt Lake City, Utah 84115

To Whom It May Concern:

C.O.P. Coal Development Company, as the owner of a dwelling within 300 feet of the mining and reclamation operations of Co-op Mining Company at Bear Canyon, Utah, which dwelling is occupied by Sportsmans, is aware of it's legal right to deny mining within 300 feet of the dwelling and has knowingly waived that right and consented to the mining and reclamation activities of Co-op Mining Company at Bear Canyon, Utah.

C.O.P. Coal Development Company

By _____
Joseph O Kingston, President
C.O.P. Coal Development Company

Sportsmans, As occupant of the dwelling above described, herby waives any right he may have to the mining and reclamation actives of Co-op Mining Company within 300 feet of said dwelling and expressly consents to the same.

Signed _____
Alan Jenkins, President
Sportsmans

Chapter 2

R645-301-200 Soils

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R645-301-200 Soils

R645-301-220 Environmental Description

R645-301-221 Prime Farmland Investigation

The entire permit area is deemed unsuitable for prime farmland based on:

1. There is no available water rights of an agricultural nature in conjunction with and of the land within the permit area.

2. The vast majority of the permit area is excessively steep to farm.

3. The nature of the soils (excessive rock) prohibits farming activities.
   Based on all of the above the only conclusion possible is there are no Prime Farmlands within the permit area. See Appendix 2-A, SCS Correspondence.

R645-301-222 Soil Survey

Five soil surveys which have been conducted on and adjacent to the permit area. The San Rafael Soil Conservation District and the Soil Conservation Service performed a soil and vegetation survey on the proposed mine property in Huntington Canyon in 1980. Soil descriptions from this survey can be found in Appendix 2-E. This survey did not characterize topsoil volumes. A second Order I soil survey was conducted in Nov 1990 by the U.S.D.A. Soil Conservation Service, at the request of the Division. The soil descriptions from this survey are also contained in Appendix 2-E. This survey was conducted subsequent to the mine disturbance.

In 1992, following this survey, in-place material at the mine site was evaluated for use as substitute topsoil material. The report of this evaluation is shown in Appendix 2-D. In 1996, soil samples were collected by Co-Op to evaluate the soils within the proposed Wild Horse Ridge disturbance. In 1998, the NRCS (formerly SCS) conducted an Order II survey of the proposed Wild Horse Ridge disturbance. No report was submitted to Co-Op by the NRCS of the results of the survey, but soil descriptions were given for the soils found. These descriptions have been included in R645-301-222.300. In 1999, an Order I soil survey was conducted by EIS for the Wild Horse Ridge area. This survey evaluated the 1996 soil samples and 1998 survey, and included additional sampling and an evaluation of the topsoil resources. The results of the 1999 survey are included in Appendix 2-F. The following sections and Plates 2-1 are based on the surveys conducted in 1990 and 1999.

The order I surveys cover approximately 32 acres in Bear Canyon in Huntington Canyon, Emery County, Section 23, 24, 25, and 26, T16S, R7E, SLBM. The soils are shown on Plates 2-1. Each soil is identified with a two or three letter symbol, and the pattern and extent are shown by the soil boundary lines on the map. Approximately 480 acres are mapped using the information from these surveys.

There are minor inclusions of other soils not identified. Also, the disturbed area and areas with man made fill, which have buildings or other man-made features on them, or areas covered with coal, could not be described as soil since they are highly variable in nature. These areas are generally made up of material from the general area or coal from the mine. The Topsoil pile is made up of topsoil and some subsoil which contains a high percent of rock.

222.100 Soil Maps

Plates 2-1 delineate different soil types.

222.200 Soil Identification

Table 2-1 Soil Maps Units

Soil Symbol	Soil Mapping Unit Name	Slopes
DZE	Datino-Sheepcan-Winetti Bouldary Loams	5 to 20 Pct slopes
PDR	Podo-Datino-Rock Outcrop Complex	40 to 70 Pct slopes
TR	Travessilla-Rock Outcrop-Strych Complex	50 to 70 Pct slopes
PC	Pathead-Cabba Complex	30 to 70 Pct slopes
WIN	Winetti, High Elevation	5 to 30 Pct slopes
WR	Winetti, High elevation-Rock Outcrop	10 to 30 Pct slopes
DON	Doney, Deep	10 to 30 Pct slopes
DG	Datino-Guben Complex	30 to 80 Pct slopes
GP	Guben-Pathead Complex	30 to 80 Pct slopes
DCP	Doney-Cabba-Podo Complex	30 to 80 Pct slopes

222.300 Soil description

A description of each soil-mapping unit is contained in the reports in Appendix 2-E and 2-F. Table 2-2 lists the Acreage of each soil unit found in the disturbed area. Following is a summary of each map unit.

Table 2-2 Soil Unit Acreages Within the Disturbed Area

Soil Symbol	Total Disturbed Acreage	Acreage with Topsoil Recovered	Est. Topsoil Depth (inches)
Disturbed	23.70	2.56[1]	In-place material[2]
DZE	1.83	1.83[3]	6
PDR	1.91	1.91	0-6
TR	1.66	1.66	0-3
PC	0.53	0.41	12
WIN	2.45	0.52	15
WR	0.72	0.50	10
DON	0.45	0.43	40
DG	3.96	2.22	6-30
GP	1.55	0.23	6-10
DCP	0.75	0.29	6-15

1 Main Topsoil Pile, 1,480 cu yds recovered from Scalehouse Pad area.
2 See Appendix 2-D.
3 Shower House Topsoil material, 1,200 cu yds recovered.

DZE - <u>Datino-Sheepcan -Winetti bouldery loams.</u>

These soils are very deep and well drained. They occur in alluvial valleys and on some moderately sloping toe slopes at elevations of 7,000 to 7,340 ft. These soils formed in alluvium and colluvium derived mainly from sandstone, limestone and shale.

Slopes are 5 to 20 pct, and are made up of the following:

Datino bouldery loam	55%
Sheepcan bouldery loam	20%
Winetti bouldery loam	15%
Other Soils	10%

Included in the other soils and land areas are the Strych soil, rubbleland, some areas of bedrock, and areas of man made fill ro disturbed areas.

Vegetation is dominantly pinion, Utah juniper, salina wildrye, squirreltail, big sagebrush, Douglas-fir, and Rocky Mountain juniper.

PDR - <u>Podo - Datino - Rock outcrop complex.</u>

This map unit is on very steep canyon side slopes. Slopes are 40 to 70, with an elevation of 7,000 to 8,000 ft.

Podo very stony fine sandy loam	35%
Datino very stony fine sandy loam	35%
Rock outcrop	20%
Other Soils	10%

Included in-other soils are Strych, Travessillia and Sheepcan soils.

Vegetation is dominantly pinion pine, Utah juniper, bitter brush curleaf mountain mahogany, Douglas fir, salina wildrye, Indian ricegrass and Rocky Mountain juniper.

TR - Travessilla - Rock outcrop - Strych complex.

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 ft. They are generally on southeast to southwest facing aspects. Slopes are 50 to 70 pct and are made up of the following:

Travesilla	35%
Rock outcrop	30%
Strych	15%
Rubble	10%
Other Soils	10%

Included in the other soils are Podo, Datino, Sheepcan and a soil similar to Travesilla with loam or clay loam textures over weathered shale.

Vegetation is dominantly pinion pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and a few Douglas fir.

PC - Pathead-Cabba Complex

These soils are well drained and range from shallow to deep. It occurs on convex foot slopes in stony colluvium and shale. Slopes are 30 to 70 pct. Vegetation is mainly Pinyon and Juniper.

WIN - Winetti, High Elevation

These soils are shallow and well drained, occurring on a high gradient, ephemeral drainage system which lacks a well-defined bottomland. Slopes are 5 to 30 pct. Vegetation includes Douglas-fir, Cottonwood, Ponderosa Pine, Dogwood, and Wild Rose.

WR - Winetti, High Elevation-Rock Outcrop

The Soils occur at the upper end of the drainage bottom in the right Fork of Bear Canyon, and consists of a narrow canyon bottom with steep side slopes. Rock outcrop is common, as well as large boulders and stones. Slopes are 10 to 30 pct and the Unit is similar to the Winetti, high elevation, but is on a narrower and rockier section along the drainage. This unit contains only thin layers of topsoil.

DON - Doney, Deep

This map unit occurs in the Wild Horse Ridge topsoil stockpile area, near the drainage bottom. It is formed from local slope wash culluvium. Soils are well-drained with moderate permeability slopes are 10 to 30 pct. Vegetation is dominantly Ponderosa Pine, Salina Wildrye and Indian Wildrye.

DG - Datino-Guben Complex

These soils are well drained occurring on a steep slope, northfasing canyon slopes are 30 to 80 pct.

Vegetation includes Utah Serviceberry, Curleaf mountain mahogany, Pinion, Juniper, and Douglas-fir.

GP - Guben-Pathead Complex

This map unit is on a steep, north-facing side slope along the Wild Horse Ridge access road. Their soils are shallow with more sandstone bedrock present. Slopes are 30 to 80 pct. Vegetation includes Douglas-fir, Pinion Pine, Bristlecone Pine, Curleaf Mountain Mahogany, and Serviceberry.

DCP - Doney-Cabba-Podo Complex

This map unit occurs on the steep, rocky, south-facing slope of the Wild Horse Ridge Blind Canyon Seam Portal site. This soil is shallow and well drained, overlapping sandstone and shale. Slopes are 30 to 80 pct. Vegetation types are typically Pinion- Juniper type.

222.400 Soil Productivity

The present and potential productivity of existing soils can be found in Appendices 2-E, and 3-B.

R645-301-223 Soil Characterization

Typical soil properties determined by the SCS are discussed in R645-301-222.300 and found in Appendix 2-E and 2-F. Results of soil testing, conducted by the operator or consultants on soils within the permit area, are found in Appendix 2-A, 2-D and 2-F. Test results from the ballpark topsoil pile material, purchased to relieve topsoil deficiencies are also included in Appendix 2-A.

The 1984 Co-Op field investigations provided information on the physical and chemical properties of soils in the permit area and is discussed in Appendix 2-A. A rating for topsoil is included on the forms, as are some chemical properties. A discussion of soils in the Wild Horse Ridge Area is included in Appendix 2-F. Soils found on-site are listed in the Soils Legend and shown on Plates 2-1. In studies during the 1984 field season on site sampling was analyzed for the required chemical properties in all horizons (see Appendix 2-A).

R645-301-224 Substitute Topsoil

Due to the large amount of pre-disturbed area and limited nature of the active disturbance within the reclamation areas, in-place materials will be used for final reclamation plant growth medium. Use of such materials has proven successful in other mines within the surrounding mining community, such as Trail Canyon. Use of this material will eliminate the need to disturb additional areas for use as plant growth material borrows.

In the summer of 1991, Co-Op conducted an extensive testing program of the on-site materials. Test results showed that in-place spoils are suitable for the plant growth material to be used for reclamation. Test pits were located with the help of Henry Sauer of the Division, to be representative of each reclamation area. Patrick Collins, Ph.D., Biologist/Reclamation Specialist of Mt Nebo Scientific was contracted to analyze the test data. A copy of the report by Mt. Nebo Scientific can be found in Appendix 2-D. The soils laboratory results from Inter-Mountain Laboratories are included in the same appendix.

Samples were taken at intervals that were representative of the layering in the soil. Samples were tested according to the parameters listed in Table 2-4. Testing from various undisturbed sites was taken for use as a comparison with the on-site material. Testing will be conducted again on the areas to determine impacts continued mining has had on suitability in the final five-year permitted period before reclamation. See R645-301-243.

The on-site material also includes the downcast material from the cut roads. Procedures have been followed that verify the suitability of this material and are discussed further in Appendix 2-B and 2-C. With proper treatment to reduce compaction and improve proper nutrients and amendments the actual road material would prove suitable, similar again to procedures in use and used at other reclamation sites that had disturbances of a pre-law (pre-1977) nature.

Although material on the out slope of the coal storage pad is adequate as substitute topsoil, much of the slopes have been covered with coal. To improve the quality of this material, interim reclamation steps have and will continue to be taken. The out slope will be cleaned of coal as needed. Berms will be used to prevent future spills onto the out slopes. All existing eroded areas will be repaired using the material beneath the coal waste storage area (sample site# CSP-5) and storage pad out slopes, and the out slopes have been revegetated according to the approved interim revegation plan in R645-301-331.

Table 2-3 summarizes the location and amount of substitute topsoil material available. The minimum cut depth column shows the depth each area will have to be cut in order to grade each of the TS areas at the depths shown in Table 2-8.

Table 2-3 Available Substitute Topsoil Material

Location	Drill Hole	Drill Depth (in)	Area (acres)	Volume Available (cu. yd)	Minimum Cut Depth (in)
TS-3	SEDB-1	24	.09	296	13
TS-3	SEDB-2	48	.09	602	13
TS-3	SHP-1	60	1.34	10,797	13
TS-3	SHP-2	60	.81	6,533	13
TS-3 Totals			2.33	18,228	
TS-4	SEDA-1	24	.24	777	2.5
TS-4	SEDA-2	24	.20	641	2.5
TS-4 Totals			.44	1,418	
TS-5	SP-1	18	.69	1,680	18
TS-5	SP-2	24	.36	1,150	24
TS-5	CSP-1	96	.95	12,292	30
TS-5	CSP-2	84	1.32	14,903	27
TS-5	CSP-3	72	.25	2,459	27
TS-5	CSP-4	60	1.67	13,477	27
TS-5	CSP-5	72	3.03	29,325	27
TS-5 Totals			8.28	75,286	
TS-6	PAR-1	84	2.62	29,589	12
TS-7	LHP-1	96	1.73	22,329	12
TS-8	USP-1	120	.87	14,036	12
TS-9	REF-1	36	.26	1,253	18
TS-9	REF-2	36	.71	3,413	18
TS-9	REF-3	36	.23	1,122	18
TS-9 Totals			1.20	5,788	

R645-301-230 Operation Plan.

R645-301-231 General Requirements

231.100 Topsoil Removing and Storing

Topsoil Removal

Much of the Bear Canyon Mine area was disturbed prior to SMCRA, as well as prior to mining of the Bear Canyon Mine. As a result, topsoil was not recovered from much of the existing disturbed area (see Table 2-2). As a result, the Ballpark Topsoil Pile was imported to use for topsoil. Investigations of in-place material which could be used as plant growth material were conducted in 1992 (Appendix 2-D), and it was determined that the in-place material within the areas where topsoil was no recovered could adequately be used as substitute topsoil material.

The depth of topsoil removed previous to 1990 (recovered in association with construction of the scale house) was determined by the amount of A and B horizon material as defined in OSM Regulation 30 CFR 783.22. Existing vegetation was removed and topsoil was collected prior to excavation or other disturbance operations within the affected areas. The topsoil removed in these areas consists of A horizon quality material and B horizon quality material with virtually no distinctive color difference. The C horizon material was not removed since it had a significant pct of rock.

Topsoil recovered after 1990 consists of the topsoil from the Shower House pad, the Tank Seam Access Road and pad, and the Wild Horse Ridge disturbed areas. The depth of topsoil recovered from these areas is discussed in R645-301-231.400.

Prior to the start of all new construction, topsoil will be analyzed for parameters as outlined in Table 2-4, to determine the extent and depth of suitable plant growth medium and will be separately salvaged and stockpiled. All sampling, testing and interpretation will be conducted by a qualified soil scientist. The Division may review the soil scientist's qualifications prior to sampling and testing of the topsoil material. Topsoil is stockpiled, consolidated and protected from wind and water erosion and contamination, which might lessen its capability to support vegetation.

The equipment used for topsoil removal consists of bulldozers, track hoes, front-end loaders, and dump trucks. The use of bulldozers requires pushing of the topsoil to a collection point for loading into dump trucks or other means of transportation to the designated stockpile. During topsoil salvage operations supervisory personnel approved by the Division will be present at the time of the topsoil removal to instruct the equipment operators in the proper techniques of topsoil removal and to ensure that required horizons are removed and stored. The individual will document topsoil salvage operations, including salvage history, soil salvage areas and volumes, and soil placement in the stockpile. Topsoil will be salvages from all areas accessible by equipment, including bouldery and steep slopes as required under R645-301-232.

TABLE 2-4a Analytical Methods For Baseline Soil Characterization

Test to be Performed	Reported As	Suggested Methods[1]
pH	saturated paste standard units	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 14, page 420 and Chapter 16, page 487.
Saturation %	%	Ibid. Chapter 14, pp 420 - 422.
EC_e	dS/m @ 25°C (or mmhos/cm)	Ibid. Chapter 14, pp 420 - 422 and pp 427 - 431.
Soluble Na, K, Mg, Ca	meq/L	Ibid. Chapters 14 pp 420-422 (saturation extract);Chapter 19 pp 555-557; Chapter 20 pp586-590 (spectroscopic methods).
Alkalinity of the saturation extract	HCO_3^- as mg/L $CaCO_3$	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods.[2] 1998. v 4.10. p 19. (Saturation Paste Extract Alkalinity, titration with 0.02N HCl)
Available NO_3-N	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 38. p 1129 (KCl extraction). For analysis follow: Sims, J.R. and G.D. Jackson. 1971. Rapid Analysis of Soil Nitrate with Chromotropic Acid. Soil Sci. Soc. Am. Proc. 35-603-606.
Available Phosphorus	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 32, page 895. ($NaHCO_3$ Extraction.)
Particle Size Analysis	% very fine sand, sand, silt, clay	Soil Science Society of America. 1986. Series No. 5. Methods of Soil Analysis: **Part 1** - Physical and Mineralogical Methods. Chapter 15 pp 398 and 404-409 (Hydrometer Method).
Organic Matter	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 86. (Loss on Ignition, convert %LOI to OM by regression intercept value as noted in method)
$CaCO_3$ %	%	Ibid. p. 99 (Soil Carbonates, Gravimetric Determination after extraction with 3 M HCl.) Total Inorganic Carbon = %$CaCO_3$ x 0.12.

[1] Laboratories vary in their capabilities. Specify these recommended methods to the laboratory. Use of other methods requires prior approval from the Division.

[2] From: Plant, Soil and Water Reference Methods for the Western Region. 1994. R.G. Gavlak, D.A. Horneck, and R.O. Miller. WREP 125.

TABLE 2-4b

Additional Analyses Required for Substitute Topsoil, Overburden, Spoil, and Coal Mine Waste.

PARAMETERS	Reported As	RECOMMENDED METHOD
Total Organic Carbon	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 88. (Combustion Method)
Soluble Selenium	mg/kg	Soil Science Society of America. Methods of Soil Analysis: Part 3 - Chemical Methods. Series No. 5, 1996.Chapter 30. pp 805 - 811. (Hydride Generation Atomic Absorption-Spectrometry and Fluorimetry of water extractable selenium)
Available Boron	mg/kg	Soil Science Society of America. Methods of Soil Analysis: Part 3 - Chemical Methods. Series No. 5, 1996.Chapter 21. p 611 (saturation extract).
Acid Potential	% S	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.6, pg 60
Neutralization Potential	% $CaCO_3$	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.3, pg 47

Topsoil Storage

Plans involving topsoil storage can be labeled as "short term" or "long term" depending on completion of activities in each area and the reclamation schedule presented. All material will be stored as required under R645-301-234.

Short-Term Topsoil Storage Areas.

Short-term stockpiles of topsoil will be for areas to be reclaimed almost immediately upon cutting. At final grade topsoil will be redistributed promptly to minimize natural degradation processes. No short-term piles are anticipated at this time. If a need arises, a site-specific plan will be submitted prior to disturbance.

Long-Term Topsoil Storage Areas.

During any new construction of areas that will be used for the duration of the mining operation within the permit area, topsoil will be collected and stockpiled. The topsoil will be used for post-mining reclamation.

During construction of topsoil stockpiles, compaction of the topsoil material will be minimized by limiting the extent of the area where equipment traffic drives on the material. Where this compaction is unavoidable, the compacted material will be ripped and loosened prior to being covered or seeded in order to leave it in a non-compacted state.

The following table summarizes the volumes of topsoil being stored.

Table 2-5 Topsoil Summary Table

Description		cu yd
Main Topsoil Pile		1,480
Tank Seam Road Topsoil Storage Areas		1,000
Wild Horse Ridge Topsoil Pile		12,254
Wild Horse Ridge Tank Seam Topsoil Pile		1,400
	Subtotal	16,134
On-site Material (Substitute Topsoil)		36,452
	Total	52,586

Suitability of Topsoil Substitutes or Supplements

Material designated to be used as substitute material have been sampled and their chemical and physical properties discussed in Appendix2-C.

231.300 Soil Testing Plan

This is outlined in R645-301-243

231.400 Construction, Modification and Maintenance

There are four existing storage areas on site that are shown on Plates 5-2. All of these sites are discussed in the following sections.

Native material to be used as substitute plant growth medium is also available on-site under the pad areas, roads, borrow pits, embankments and as downcast material for the cut road areas. R645-301-224 discusses use of the "on-site" material. In order to show that the downcast material from the Portal Access Road is adequate and suitable as final reclamation plant growth material, procedures outlined in Appendix 2-C will be followed. With the successful use of in-place materials at Trail Canyon and other mines within the Emery County area, Co-Op is confident that all requirements will be met with minimal impact to the area.

When the large flat or pad areas were constructed, the upper most material (topsoil) was pushed to the bottom of the pile and covered with material taken from the created cut slopes and highwalls. Although this material is becoming compacted during operation the non-toxic and non-acid forming nature of the coal and other possible contaminants poses little potential impact to the suitability of this soil.

All areas used for plant growth material sites will be revegetated and the soil stabilized during the first fall following removal. Reclamation will follow the procedures defined in this plan. The following topsoil piles are located within areas of the permit boundary. These piles should be considered "long term".

Main Topsoil Storage Pile

The original topsoil storage pile is located northeast of the scale house in Bear Canyon. This pile consisted of topsoil material stripped from the Bear Canyon disturbance during construction of the scale house etc. The results of an as-built survey conducted in 1990, see Plate 2-2A, showed that the pile contained a reserve of approx 1,480 cu yds. The pile is marked and protected by a berm and vegetation to prevent soil loss.

Due to the suitability of "in-place" soils, material in the main topsoil pile will be used on specific locations determined during reclamation recontouring.

Ball Park Topsoil Storage Pile

3,400 cu yds of topsoil material was purchased for use and stored on the Bear Canyon Ball Park area located south-west of the scale house. This material was stripped from an area purchased by Co-Op from R. D. Campbell in Carbon County, along the Price River, and brought to Bear Canyon to make up the deficit in required topsoil. Subsequent testing has shown that onsite material is available for reclamation of the entire site, as discussed in R645-301-224. Therefore the ballpark topsoil pile will not be needed for reclamation.

The Ball Park topsoil storage area was added to the permit area 8 February 1985 and was incorporated into the plan based on the following on-site conditions:

1. The mine site was fully occupied with the existing structures.

2. There appeared to be no site within the permit boundary that could be utilized without massive additional disturbance.

3. Due to the critical winter range statute of the canyon bottom for Mule deer winter feed, any additional disturbance was deemed unwarranted.

4. The vegetation established at the additional site would enhance wildlife feed.

The Ball Park topsoil storage area is shown in Figures 2-1 and 2-2. Topsoil was placed in non-compacted lifts to a depth of 22 to 24 in. over an area of approx 1.28 acres (3,960 cu yds). The area is protected by a berm, and has been revegetated according to the seed mix in Table 2-6. This seed mix is designed for a rapid establishment of a turf suitable for recreation use as well as rapid establishment of a dense sod covering. A sprinkling system is installed on this area to ensure both establishment and permanence.

Since a demonstration has been made in R645-301-242 that this material is not needed, the material has been left in place on the ballpark for the post-mining land use.

Table 2-6 Ball Park Seed List

Species	Coverage
Poa pratensis	50#/acre
Festuca dasycloda	50#/acre

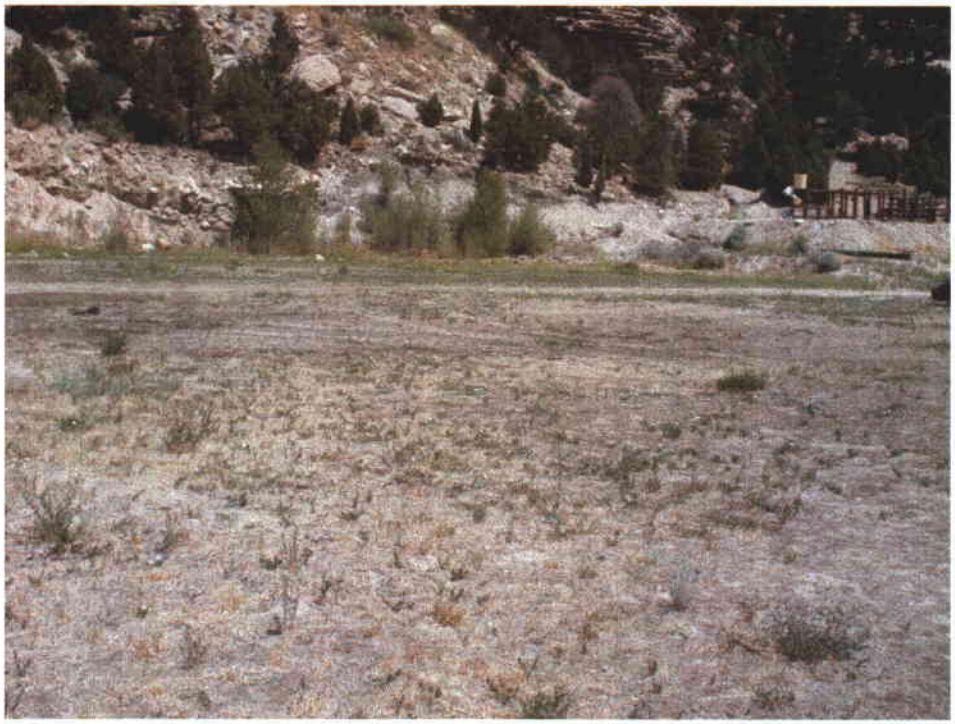

Figure 2-1 Photographs of Ball Park Area

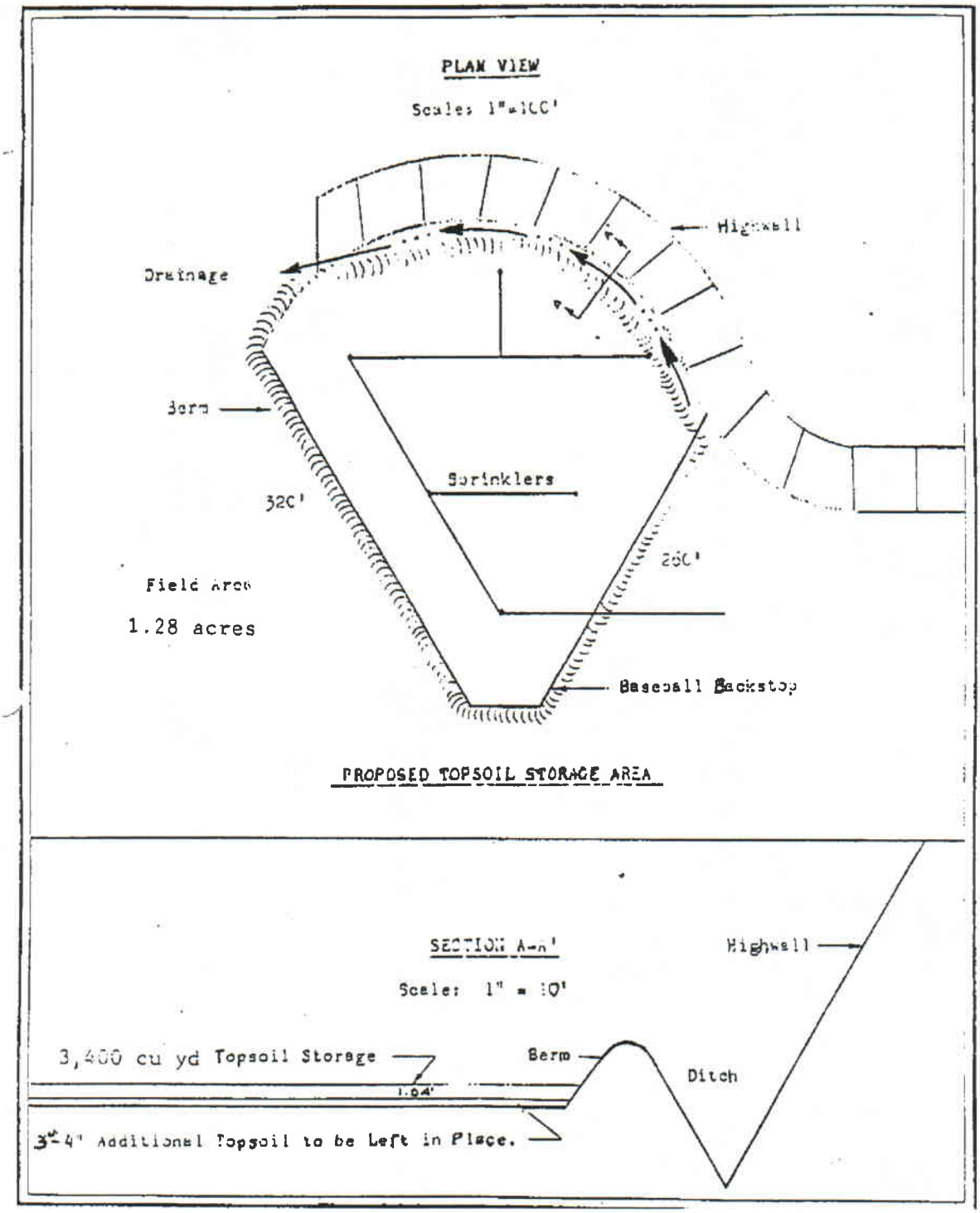

Figure 2-2 Ballpark Topsoil Storage Pile

Tank Seam Access Road and Portal Pad Topsoil Pile

A survey of topsoil material was performed in the area of the Tank Seam access road and portal pad area in 1992. Four sites were sampled and the soil was analyzed. These sites are designated on Plate 2-3E as TSA-1, TSA-2, TSA-3 and TSA-4 (See Appendix 2-A for test results). Results indicated highest organic matter accumulations in the top 0-6 inches. Test results also indicate that the material tested is suitable for final reclamation material at all depths. See discussion in Appendix 2-D. Soil depths were determined by the visible presence of organic matter and a distinct soil color change. The observations indicated a varying soil depth of 0 to 8 inches, the lesser depths being in the steep rocky areas. During construction, topsoil was stripped at depths varying from 0 to 8 inches by visually observing the depth at which organic material is found in the soil. The volume of topsoil which was recovered and placed in the designated storage area is 1,000 cubic yards.

Topsoil was recovered on the access road during construction and relocated to topsoil areas shown on Plate 5-2C and 5-2E. Plates 2-2 show the details of the topsoil stockpiles. Upon completion of the topsoil recovery and storage, the topsoil was revegetated. A berm is maintained around the piles to totally contain runoff from the piles. Typical dimensions of the berms are shown on Plates 2-2 and described in Appendix 7-K, BTCA area "P".

Wild Horse Ridge Topsoil Stockpile

A survey of topsoil material was performed in the area of the shower house pad and Sediment Pond "C". Three sites were sampled and the soil was analyzed. These sites are

designated on Plate 2-3B as REF-1, REF-2 and REF-3 (See Appendix 2-A and 2-D for test results). Results indicated organic matter accumulations in the top 4 inches of REF-1 and REF-3 and the top 8 inches of REF-2. A field survey was conducted to verify the depths. Soil depths were determined by the visible presence of organic matter and a distinct soil color change. Field observations showed soil depths of 5 inches for REF-1, 8 inches for REF-2 and 7 inches for REF-3. Other sites were excavated and observed visually throughout the area. The observations indicated a varying soil depth of 6 to 8 inches, the lesser depths being in the vicinity of REF-1. Soil depths averaged 8 inches in the vicinity of REF-2 (0.47 acres), 7 inches in the vicinity of REF-3 (0.69 acres) and 6 inches in the vicinity of REF-1 (0.68 acres).

Prior to construction on the shower house pad, topsoil material was salvaged at these approximate depths and stockpiled. Topsoil salvage consisted of confirming and staking out depths throughout the area to facilitate excavation activities, removing vegetation and large rocks which could interfere with topsoil salvage operations. Shrubs and herbaceous vegetation were salvaged along with the topsoil material to enhance the quality of the salvaged material. The final topsoil stockpile consisted of 1200 cu yds of material for reclamation, due to the extreme amount of boulders and rocks on the surface which were too large in volume to place in the pile.

In 2001, Co-Op relocated this topsoil material to the Wild Horse Ridge topsoil stockpile.

An Order I soil survey of topsoil material was performed in the Wild Horse Ridge area. The results of this survey are included in Appendix 2-F and Appendix 2-G.

Topsoil salvage depths for each unit are shown on page 13 of Appendix 2-F, and page 7 of Appendix 2-G. Soil map units are shown on Plate 2-1. Co-Op proposes to salvage topsoil in

Topsoil salvage depths for each unit are shown on page 13 of Appendix 2-F, and page 7 of Appendix 2-G. Soil map units are shown on Plate 2-1. Co-Op proposes to salvage topsoil in accordance with Appendix 2-F. The actual depth may vary in areas where high organic material is present at deeper or shallower depths, or where bouldery material precludes accurate salvage of the specified depths.

Topsoil ~~will be~~ was recovered during construction and relocated to the stockpile area shown on Plates 5-2F and 5-2G. A total of 8,700 cubic yards of topsoil ~~will be~~ was recovered during construction of the Blind Canyon Seam Pad, as shown in Table 5J-1. Plate 2-2E shows the details of the topsoil stockpile. The topsoil stockpile will be surrounded with a containment berm and protected as stated in R645-301-234.220. An additional volume of 2,354 cubic yards of topsoil within the stockpile area will not be disturbed, but is included in the total available volume in Table 2-8. Permeable fabric strips will be placed over this area prior to stockpiling additional topsoil in the area to preserve the location of the contact between the native topsoil and additional topsoil placed in the pile.

During construction of the Tank Seam Pad a total of 1,300 cubic yards of topsoil ~~will be~~ was recovered, as shown in Table 5K-1. Details of the topsoil stockpile are shown in Appendix 5-K

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R645-301-232 Topsoil and Subsoil Removal

232.100 Topsoil Removal Prior to Disturbance

Topsoil will be removed prior to disturbance, where possible, and stored for reclamation.

232.200 Insufficient Topsoil

Material to be utilized for final reclamation have all proven to be of a quality suitable for reclamation purposes.

232.300 Topsoil material less then 6" thick

More than six inches of material exists at all sites were topsoil was recovered and where substitute topsoil will be removed.

232.400 Area where topsoil will not be recovered

The Division will determine areas where topsoil will not be recovered.

232.500 Subsoil Segregation

The Division will determine the need for subsoil segregation.

232.600 Timing

Soil material will be removed after the vegetative cover is cleared away and prior to other surface disturbances.

R645-301-233 Topsoil Substitutes and Supplements

C.W. Mining Co. has conducted filed studies to demonstrate that all substitute topsoil material meets the requirements of R645-301-233. The results of these studies can be found in Appendix 2-C.

R645-301-234 Topsoil Storage

234.100 Stockpiling of Topsoil

Materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 will be stockpiled when it is impractical to redistribute such materials promptly on regraded areas.

234.210 Topsoil Placement

Material will be placed on a stable site within the permit area.

234.220 & 234.230 Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

1. A stable surface will be provided in an area outside the influence of active operations.

2. As a stockpile is completed, it will be left in a rough condition to minimize erosion.

3. Stockpiles will be situated out of drainage to prevent water erosion. A berm will be constructed around the stockpiles.

4. Storage piles will be vegetated with quick growing, soil-stabilizing plants. Revegetation will involve the immediate seeding and mulching of stockpiles during the next planting season with the seed mixture recommended in R645-301-341, in compliance with the requirements of the appropriate land management agency.

5. Signs will be posted to protect the stockpiles from accidental use as fill or from other inadvertent material contamination. The establishment of noxious plant species will be prevented.

6. Stockpiled topsoil will not be removed or otherwise disturbed until required for redistribution on a prepared and regraded disturbed area.

234.240 Topsoil Movement

Topsoil material will not be moved until required for redistribution unless approved by the Division.

R645-301-240 Reclamation Plan

R645-301-241 General Requirements

During reclamation of the areas shown in Table 2-7, the areas will be regraded as described in Appendix 5-I. Areas containing substitute topsoil material will be regraded by stripping the substitute topsoil material and placing it over adjacent areas in which the regrading has been completed. The material will be recovered to the depth needed to obtain the volumes of material shown in Table 2-8.

Table 2-8 shows the estimated volume required. The depths shown are the minimum depths. Actual depths may be greater in some areas. In Table 2-8, the "Substitute Topsoil Generated from Cuts" shows the actual volumes of available material which are expected to be re-graded, showing that there is a sufficient amount of substitute topsoil material available to meet the proposed topsoil depths as shown in the table. These volumes are included in the total volume of regraded material shown in Appendix 5-I. A detailed description of the reclamation for each area is included in R645-301-242.

Table 2-7 Reclamation Area Summary					
MARK[1]	DESCRIPTION	Total ac.[1,2,3]	Re-contour acres[1&3]	Pre-1977 acres[2]	New acres
TS-1	Ball Park Topsoil Pile	1.27	0.0	-0-	1.27
TS-2	Lower Haul Road	1.6	0.0	1.6	-0-
TS-3	Sed Pond B & Scale Office Pad	2.60	1.41	1.23	1.37
TS-4	Sed Pond A	0.75	0.75	-0-	0.75
TS-5	Main Pad Area	12.32	9.41	8.89	3.43
TS-6	Portal Access Road	3.25	3.25	0.02	3.23
TS-7	Blind Canyon Seam Portal Area	1.81	1.81	0.51	1.30
TS-8	Upper Storage Pad	0.87	0.83	-0-	0.87
TS-9	Shower House Pad	1.83	1.83	-0-	1.83
TS-10	Tank Seam Access Road	2.91	2.91	-0-	2.91
TS-11	Tank Seam Portal Pad	0.66	0.59	-0-	0.66
TS-12	Wild Horse Ridge Access Road	3.26	0.22	-0-	3.26
TS-13	Conveyor belt Access/Topsoil	1.50	1.14	-0-	1.50
TS-14	Upper Conveyor belt Access Road	.96	0.66	-0-	0.96
TS-15	WHR Blind Canyon Seam Portal Area	1.58	1.58	-0-	1.58
TS-16	WHR TS Lower Portal Access Road	0.89	0.0	-0-	0.89
TS-17	WHR TS Upper Access Road and Pad	2.22	1.74	-0-	2.22
TOTAL		40.28	28.13	12.25	28.03

Notes:

1. See Plates 2-3.
2. See Plates 5-2.
3. The total acres represent acreage which will be reclaimed. Some of the acres will not require re-contouring or regrading during reclamation. The "Re-contour acres" represent the total acres which will require regrading. The "Total acres" shown will be reclaimed in accordance with the reclamation plan.

The proposed substitute topsoil material will be re-tested in the final five years of operations according to Table 5O-1 and will include Total Petroleum Hydrocarbons by EPA Methods 8015 and 418.1. The location of these samples will correlate with the areas generating the most substitute topsoil material as described in Appendix 5-I. Following regrading, soils remaining on the surface as substitute topsoil material will be sampled for pH, EC, and Total Hydrocarbons by EPA method 8015 for diesel fuel and 418.8 for waste oil.

Table 2-8 Substitute Topsoil Summary

	Topsoil Amounts Required			Substitute Topsoil Generated from Cuts (cu. yd.)			
Location	Area (acres)	Depth (in.)	**Volume (cu. yd.)**	Topsoil Stockpile	Sub. Topsoil Generated	Sub. Topsoil Not Regraded	Total Topsoil
TS-3	1.41	12	**2,275**	0	2,080	2,563	**4,643**
TS-4	.75	10	**1,008**	0	1,008	0	**1,008**
TS-5	9.41	12	**15,181**	0	21,492	4,537	**26,029**
TS-6	3.25	12	**5,243**	0	7,111	0	**7,111**
TS-7	1.81	12	**2,920**	0	4,170	0	**4,170**
TS-8	.83	12	**1,339**	0	3,552	0	**3,552**
TS-9	1.83	12	**2,952**	1,200	3,761	0	**4,961**
Total			**36,452**				**51,842**

R645-301-242 Soil Redistribution.

Following backfilling and regrading and prior to topsoil redistribution, regraded land will be scarified by a ripper to a depth of 14 in. in order to reduce surface compaction, provide a roughened surface assuring topsoil adherence if required, and promote root penetration. Steep slope areas which must remain after abandonment will receive special ripping to create ledges, crevices, pockets, and screens. All reclaimed areas will be gouged to roughen the surface. This will allow better soil retention and vegetation establishment.

Each of the reclamation areas is discussed below as labeled on Plates 2-3. Topsoil will be distributed on reclamation areas as required prior to seeding. Topsoil redistribution procedures will ensure an approx uniform thickness of 5 inches as indicated by Soil Survey - Nov 1990 (Appendix 2-E), or as outlined in sections below. Topsoil will be redistributed in the fall of the year (Sept-Oct) suitable for establishment of permanent vegetation. A very roughened seedbed will be left in all cases.

To minimize compaction of the topsoil following preparation and/or redistribution, travel on reclaimed areas will not be allowed. Co-Op will exercise care to guard against erosion during and after application of topsoil and will use mulch, tackifiers, and erosion control matting as defined in R645-301-341.

The soil stabilization methodology that will be used includes the placement of crushed and heavier material at the toe of road fill slopes, and the random placement of large rocks and boulders on the surface. This procedure will enhance the microclimate as well as make the

reclaimed area more aesthetically compatible with the undisturbed surroundings. The detailed revegetation plan to be submitted in the last five year permit renewal prior to reclamation, will include maps showing the areas to receive matting.

TS-1 Ball Park Topsoil Pile. Reclamation plant growth material will come from in-place material.

TS-2 Lower Haul Road. Disturbance to this section is limited to the road impacts from added road base material, compaction and minor spills of coal material that occur from haul vehicles. This area is within the pre-1977 disturbance area and did not have topsoil recovered for reclamation purposes. With ripping, regrading and seedbed preparation as described in this plan additional plant growth material will not be required.

TS-3 Sediment Pond B and Scale House. Approx one half of this area is within the pre-1977 disturbed area. The embankment material from sed pond B is vegetated showing its suitability as substitute plant growth material. The material over the culverted creek is seeded as a back yard for the scale house also indicating good suitability. With removal of the culvert this material will be available for distribution. The road material can be treated as in area TS-2. A total 18,228 cu. yd. of substitute topsoil material is available in the recovered area. 0.32 acres will not be regraded but will simply be ripped to a depth of 12 inches and used in place giving a volume of

2,563 cu. yd. non-regraded substitute topsoil material. 2,080 cu. yd. of the available substitute topsoil will be used in the remaining area giving a depth of at least 12 inches of substitute topsoil material over the entire area.

TS-4 Sediment Pond A. The embankment material from sed pond A is vegetated indicating good suitability as substitute plant growth material. 1,418 cu. yd. of substitute topsoil material is available in the recovered area. 1,008 cu. yd. of this material will be used giving a minimum depth of 10 inches.

TS-5 Main Pad Area. Covering approx 12.32 acres, this is the largest of the disturbed areas. Approx one third of this area is covered with coal storage. All but approx two acres of this area are within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Although the coal storage and traffic within this area will compact the fill material, testing shows that it is suitable as plant growth material. Fill used for the upper layer of recontouring material will come from the outer or eastern edge of the pad. This material was the topsoil prior to Mining. 75,286 cu. yd. of substitute topsoil material was tested in the recovered area. 15,181 cu. yd. of this material will be used giving a minimum depth of 12 inches over the entire area. 15,428 cu. yd. of fill material will be generated in this area for use in TS-7 and TS-8.

TS-6 Portal Access Road. This area was disturbed prior to initiation of Mining by Co-Op Mining Co. and did not have topsoil recovered for reclamation purposes. This area has received special attention in the past and is discussed in Appendix 2-C. This area will be treated the same as area TS-2. 29,589 cu. yd. of substitute topsoil material is available in the recovered area. 7,111 cu. yd. of material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 2,553 cu. yd. of fill material will be generated in this area for use in TS-7 and TS-8.

TS-7 Portal Pad Area. Most of this area is within the pre-1977 disturbed area and did not have topsoil recovered for reclamation purposes. Downcast material will be recovered for reclamation. 22,329 cu. yd. of substitute topsoil material is available in the recovered area. 4,170 cu. yd. of this material will be used giving a minimum depth of 12 inches of substitute topsoil material over the entire area. 11,582 cu. yd. of fill material will come from TS-5 and TS-6.

TS-8 Upper Storage Pad. This area did not have topsoil recovered for reclamation purposes. Non-toxic and non-acid forming materials are stored on the pad. Sources for contamination are minimal. This area will be treated the same as TS-7. Some material from the lower pad areas will be required to recover the highwalls. See Appendix 5-I. 14,036 cu. yd. of substitute topsoil material is available in the recovered area. 3,552 cu. yd. of this material will be used giving a

minimum depth of 12 inches of substitute topsoil material over the entire area. 1,952 cu. yd. of fill material will come from TS-5 and TS-6.

TS-9 Shower House Pad. This area will have topsoil recovered for reclamation purposes. Sources for contamination are minimal. Following recontouring at the time of final reclamation, the topsoil material recovered prior to construction will be spread over the surface to attain an approx depth of 7 inches. Additional in place material has been tested and is available in the recovered area for substitute topsoil. At least 2,952 cu. yd. of this material will be placed below the 7 inches of topsoil, giving a minimum depth of 12 inches of topsoil or substitute topsoil material over the entire area.

TS-10 Tank Seam Access Road. Topsoil material recovered during construction will be placed in the topsoil storage piles located along the Tank Seam access road and is shown on Plate 2-2E. Additional plant growth material will not be required.

TS-11 Tank Seam Portal Pad. Topsoil material recovered during construction will be placed in the topsoil storage pile shown on Plate 2-3E and 2-2E.

TS-12 Wild Horse Ridge Access Road This road existing prior to mining and will remain in place after mining activities. Some upgrading and widening of the road will be required for mining use, so topsoil will be recovered from isolated areas of new disturbance and placed in the topsoil storage pile shown on Plate 2-3F and 2-2B. These soils were identified as Winetti soils, and approximately 15" of topsoil will be salvaged from 0.22 acres. A total volume of 444 yd^3 of topsoil will be salvaged. These same areas will require topsoil redistribution during reclamation. The 15" depth recovered from these areas will be redistributed at the same depth. Additional plant growth material will not be required.

TS-13 Conveyor belt Access/Topsoil Stockpile: This area will have topsoil recovered for reclamation purposes. The depth of recovery will be as follows: 12"of topsoil from 0.41 acres of the Pathead-Cabba Complex; 15" of topsoil from 0.30 acres of Winetti soil; and 40" from 0.43 acres of Doney Complex. (See Appendix 2-F). A total volume of 3,579 yd^3 will be recovered from this area. This includes 2,354 yd^3 located within the topsoil storage area. Topsoil from this area and additional areas will be stored as shown on Plate 2-2B. Sources for contamination are minimal since this area is isolated form the majority of the mining activities. Following recontouring at the time of final reclamation, the topsoil material recovered prior to construction will be spread over the surface to obtain an approximate depth of 13 to 14 inches. Some topsoil from this area may be available for use in other areas of the mine site, since up to 40" of topsoil was originally recovered from parts of this area (see R645-301-231.400).

TS-14 Upper Conveyor belt/Access Road: The depth of topsoil recovered will be as follows: 15" of topsoil from 0.03 acres of Doney-Cabba-Podo Complex; 30" of topsoil from 0.47 acres of Datino-Guben Complex; and 10" of topsoil from 0.16 acres of Winetti-Rock Outcrop Complex. A total volume of 2,171 yd^3 will be recovered from this area. Topsoil will be relocated to the Wild Horse Ridge topsoil stockpile shown on Plate 2-2B and 2-3F. Topsoil recovered form this area will be redistributed at an average depth of 13 to 14 inches. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures for this area.

TS-15 WHR Blind Canyon Seam Portal: The depth of topsoil recovered will be as follows: 15" of topsoil from 0.19 acres of Doney-Cabba-Podo Complex; 30" of topsoil from 0.97 acres of Datino-Guben Complex; 10" of topsoil from 0.34 acres of Winetti-Rock Outcrop Complex; and 10" of topsoil from 0.08 acres of Guben-Pathead Complex. A total volume of 4,860 yd^3 will be salvaged from this area. Topsoil will be relocated to the Wild Horse Ridge topsoil stockpile shown on Plate 2-3F and 2-2B. Topsoil recovered form this area will be redistributed at an average depth of 13 to 14 inches. Topsoil redistribution will be performed in conjunction with regrading due to the remoteness of the site and the reclamation procedures for this area.

TS-16 WHR Tank Seam Lower Portal Access Road: The area consists of an existing recreational road that was in place before mining and will be used post mining. The road will be widened in a in two areas. These areas are shown on Plate 2-3G and have cross-sections through them. The cross-sections are shown in Appendix 5-K. 124 cubic yards of topsoil material will be recovered from this area, and will be relocated to the Wild Horse Ridge Tank Seam Topsoil Stockpile shown on Plate 2-3G. The soils located in this area are described in Appendix 2-G.

TS-17 WHR Tank Seam Upper Access Road and Pad: The soil located in this area is 1.79 acres of Datino Guben Complex. Approximately 6-10" of topsoil will be recovered and may be as deep as 20" along the northeast edge of the pad as described in Appendices 5-K and 2-G. A total volume of 1,317 yd^3 will be salvaged from this area. Topsoil will be relocated to the Wild Horse Ridge Tank Seam Topsoil Stockpile shown on Plate 2-3G and in Appendix 5-K. Topsoil recovered from this area will be redistributed at an average depth of 8". Topsoil redistribution will be performed in conjunction with regarding due to the remoteness of the site and the reclamation procedures for this area.

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R645-301-243 Soil Nutrients and Amendments

Following final grading test samples will be taken to represent each of the reclamation areas shown on Plates 2-3. Table 2-9 shows the sample frequency for each reclamation area. Additional samples will be taken in the event that the initial sample indicates unsuitable material. Composite samples will be taken from 0 to 2 ft and from 2 ft to 4 ft at each sample location.

Chemical analysis will be conducted in accordance with the Utah Division of Oil, Gas and Mining Soils Guidelines as outlined in Table 2-7. All necessary fertilization and/or neutralizing compounds will be applied according to the results of the soil sampling and analysis program approved by the division.

2-9 Final Grading Test Sample Density			
MARK	DESCRIPTION	Acreage	SAMPLE FREQUENCY
TS-1	Ball Park Topsoil Pile	1.27	1
TS-2	Lower Haul Road	1.6	1
TS-3	Sed Pond B & Scale Office Pad	2.56	1
TS-4	Sed Pond A	0.75	1
TS-5	Main Pad Area	12.30	5
TS-6	Portal Access Road	2.62	2
TS-7	Blind Canyon Seam Portal Area	1.73	1
TS-8	Upper Storage Pad	0.87	1
TS-9	Shower House Pad	1.83	1
TS-10	Tank Seam Access Road	2.91	2
TS-11	Tank Seam Portal Pad	0.66	1
TS-12	Wild Horse Ridge Access Road	3.26	2
TS-13	Conveyor belt Access/Topsoil Stockpile	1.50	2
TS-14	Upper Conveyor belt Access Road	0.96	1
TS-15	WHR Blind Canyon Seam Portal Area	1.58	2
TS-16	WHR Tank Seam Lower Portal Access Road	0.89	0
TS-17	WHR Tank Seam Upper Access Road and Pad	2.22	2

R645-301-244 Soil Stabilization

244.100 Exposed Surfaces

Exposed regarded surfaces or topsoil will be protected and stabilized to control erosion and minimize air pollution associated with erosion.

244.200 Soil Stabilization

Suitable mulch and other soil stabilizing practices will be applied where such methods are necessary to control erosion and establish an effective vegetative cover.

244.300 Rills and Gullies

Whenever rills or gullies become evident they will be filled, re-graded, rip-rapped and re-seeded tackified, and mulched. This work will commence prior to any significant loss (Rills and Gullies, less than 9 in.).

R645-301-250 Performance Standards

All topsoil, subsoil and topsoil substitutes or supplements will be removed, maintained and redistributed according to the plan given under R645-301-230 and R645-301-240.

All stockpiled topsoil, subsoil and topsoil substitutes or supplements will be located, maintained and redistributed according to plans given under R645-301-230 and R645-301-240.

Appendix 2-A

SOIL TEST REPORTS

SCOPE

This appendix includes test results from soil samples taken on proposed plant growth material to determine suitability for reclamation procedures.

1984

In order to determine feasibility and suitability of downcast and off site substitute topsoil materials, the following soil inventory and survey were conducted in 1984:

METHODOLOGY

On March 24, 1984, M. A. Coonrod, Compliance and permitting Coordinator for the mine, sampled soil along the old portal road, topsoil purchased off site and the existing topsoil pile. The sample procedure for each site is as follows:

Existing Topsoil Stockpile (Sample 1D_P1).

A randomly selected spot was determined by walking 10 paces up the pile from a random point selected by throwing a marker onto the pile. A 14 in. tile spade was utilized to excavate a hole 24 in. in depth and approx 18 in. in diameter. A silver of soil approx 1 in. x 4 in. was sliced from top to bottom of the excavation. The material was placed in a clean plastic bag and sealed (approx 3 lbs) Rock larger than approx 1 in. dia were avoided in containerizing the sample.

Loadout Alternative Soil Substitute (Sample 1D P2).

Co-Op has purchased approx 80 acres along the Price river, Carbon County, Utah from R. D. Campbell. A portion of the site had the topsoil stripped and stockpiled. The same sample methodology implemented on the existing topsoil pile at the mine was utilized at this alternative soil substitute.

Road Fill (Sample ID FR 3 st 1,3 & 6).

This material was sampled at 200 ft intervals from the down slope of the fill in the area of the portal road intersection to the non-coal storage site along Bear Creek. Each sample was taken 3 ft from the toe of the down-cast material. A 14 in. tile spade was used to excavate approx 1 ft into the fill material and a grab sample (Approx 1 lb of material) was taken at each site. All samples were consolidated into 3-5 gallon plastic buckets labeled 1, 3 and 6.

At the conclusion of the survey, all samples were consolidated and mixed. From this consolidated material, a sample of approx 8 lbs was placed into a clean plastic bag. All samples were hand carried to Standard Laboratories north of Huntington, Utah on March 24, 1984.

1991

In order to determine feasibility and suitability of in-place spoils as final reclamation substitute plant growth materials an extensive testing program was implemented. Test results and a report made by Mt. Nebo Scientific reviewing the material is included as Appendix 2-D. Three soil samples were tested for the shower house pad. Ref-1 is found in Appendix 2-D. Results from Ref-2 and Ref-3 are found in this appendix.

RESULTS AND CONCLUSIONS

Attached are copies of the laboratory results. It appears that all materials on site as well as the off site substitute (Ball Park Topsoil Storage) are compatible and capable of establishing and maintaining a diverse vegetative community consistent with the existing reference area. The use of the acceptable in-place materials as substitute plant growth eliminates additional impact on the environment which would result from having to "borrow" material from undisturbed areas as a substitute, and therefore results in the best available material to use for plant growth with no additional environmental impact.

Prior to implementing reclamation, all soils will be tested again to determine the need for both type and quantity of desired fertilizers to insure rapid establishment of vegetation. See R645-301-243.

SOIL TEST REPORT

NO. 7404.0

AGRICULTURAL CONSULTANTS, INC.
P.O. DRAWER 507 — 240 S. FIRST AVENUE
BRIGHTON, COLORADO 80601
303/659-2313

DATE RCVD 11-12-92

REPORTED 11-23-92

REPORT TO: CO-OP MINING COMPANY ATTN: MR. OWEN

BILL TO: SAME

GROWER: SAME

SAMPLE ID: BEAR UPPER PAD

TEXTURE (silt, silty loam, sand, sandy loam, loam, clay)	pH		CEC Meq /100g	SALT Mmhos /cm	Na Meq /100g	Lime %	OM %	Org N Lbs	AVAILABLE NUTRIENTS ppm (1)										
	H_2O	Buf							NO_3	P(2)	K(2)	Ca	Mg	S(2)	B	Zn	Fe	Mn	Cu
LO	9.3	7.0	9.5	1.9	0.2	8.7	0.9	31.5	9	1	44	2700	250	58	0.2	0.4	1.5	1.1	0.3

CROP	YIELD GOAL	CROP RESIDUE T/A	MNR T/A	RECOMMENDATIONS POUNDS PER ACRE											
				N	P_2O_5	K_2O	Elem Sulfur	Lime	Mg	SO_4-S	Boron	Zinc	Iron	Mn	Cu
CL Native Grasses	Average	-	0	50	30	70	0	0	0	0	0	0	0	0	0

1 ppm=parts per million or lbs element per million lbs soil. ppm x 2 = lbs/acre 6-7" depth. ppm x 3.5 = lbs/acre first. 2. P x 2.3 = P_2O_5 K x 1.2 = K_2O S x 3 =

Values reported but without specific remarks are considered to be within growth range of intended crop.

If poor moisture conditions reduce fertilization accordingly.

Supervised by _____

ATTACHMENT 1-A

SOIL TEST REPORT

NO. 7405.0

AGRICULTURAL CONSULTANTS, INC.
P.O. DRAWER 507 — 240 S. FIRST AVENUE
BRIGHTON, COLORADO 80601
303/659-2313

DATE RCVD 11-12

REPORTED 11-23-82

REPORT TO: CO-OP MINING COMPANY ATTN: MR. OWEN

BILL TO: SAME

GROWER: SAME

SAMPLE ID: BEAR POWER POLE

TEXTURE (sandy, silty loam, sand, sandy loam, loamy clay)	pH		CEC Meq /100g	SALT Mmhos /cm	Na Meq /100g	Lime %	OM %	Org N Lbs	AVAILABLE NUTRIENTS ppm (1)										
	H_2O	Buf							NO_3	P(2)	K(2)	Ca	Mg	S(2)	B	Zn	Fe	Mn	Cu
	8.0	7.0	38.7	4.6	0.3	9.1	1.8	45.0	6	1	90	9900	510	204	0.6	0.4	4.6	1.4	0.4

CROP	YIELD GOAL	CROP RESIDUE T/A	MNR T/A	RECOMMENDATIONS POUNDS PER ACRE											
				N	P_2O_5	K_2O	Elem Sulfer	Lime	Mg	SO_4-S	Boron	Zinc	Iron	Mn	Cu
DL Native Grasses	Average	-	0	50	50	90	0	0	0	0	0	0	0	0	0

1.ppm=parts per million or lbs element per million lbs soil. ppm x 2 = lbs/acre 6-7" depth. ppm x 3.5 = lbs/acre feet. 2. P x 2.3 = P_2O_5 K x 1.2 = K_2O S x 3 =

Values reported but without specific remarks are considered to be within growth range of intended crop.

If poor moisture conditions reduce fertilization accordingly.

Supervised by Diane Lansing

AI: MENTI-A

SOIL TEST REPORT

NO. 7404.0

AGRICULTURAL CONSULTANTS, INC.
P.O. DRAWER 30 — 240 S. FIRST AVENUE
BRIGHTON, COLORADO 80601
303/659-2313

DATE RCVD 11-12-

REPORTED 11-23-92

REPORT TO: CO-OP MINING COMPANY ATTN: MR. OWEN

BILL TO: SAME

GROWER: SAME

SAMPLE ID: SCALES BEAR

TEXTURE (sand, silty sand, sandy loam, loam, clay)	pH		CEC Meq /100g	SALT Mmhos /cm	Na Meq /100g	Lime %	OM %	Org N Lbs	AVAILABLE NUTRIENTS ppm (1)										
	H_2O	Buf							NO_3	P(2)	K(2)	Ca	Mg	S(2)	B	Zn	Fe	Mn	Cu
LD	8.3	7.0	11.1	1.0	0.2	8.6	1.3	45.5	8	3	99	3400	210	31	0.6	0.6	3.8	2.0	0.3

CROP	YIELD GOAL	CROP RESIDUE T/A	MNR T/A	RECOMMENDATIONS: POUNDS PER ACRE											
				N	P_2O_5	K_2O	Elem Sulfur	Lime	Mg	SO_4-S	Boron	Zinc	Iron	Mn	Cu
DL Native Grasses	Average	-	0	40	50	50	0	0	0	0	0	0	0	0	0

1. ppm=parts per million or lbs element per million lbs soil. ppm x 2 = lbs/acre 6-7" depth. ppm x 3.5 = lbs/acre foot. 2. P x 2.3 = P_2O_5 K x 1.2 = K_2O S x 3 =

Values reported but without specific remarks are considered to be within growth range of intended crop.

If poor moisture conditions reduce fertilization accordingly.

Advised by Diane Lansing

ATTACHMENT 1-A

Branch Code 43
(see reverse)

Lab. No. 43728

Date Rec'd. 3-24-84

Date Sampled 3-24-84

Sampled By Yourselves

STANDARD LABORATORIES, INC.

Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Sample ID: RF-3 Road Fill St 1, 3 & 6

ACID-BASE ACCOUNTABILITY

				$CaCO_3$ Equiv. (Tons/1000 Tons Material)		
Color	Paste pH	Fizz	% Sul.	Max from % Sul.	Amount Present	Excess
10YR7/2	7.75	5	<0.001	<0.03	242.77	242.74

NUTRIENTS:

Phosphorus = 14.9 pp2m (Sodium Bicarbonate Extractable)

Magnesium = 0.77 Tons/1000 Tons material (Double Acid Extractable)

Potassium = 0.05 Tons/1000 Tons Material (Double Acid Extractable)

Calcium = 8.1 Tons/1000 Tons material (Double Acid Extractable)

Nitrate-N = 270 ppm (Phenoldisulfonic Acid Method)

Respectfully Submitted,

FOR YOUR PROTECTION THIS DOCUMENT HAS BEEN PRINTED ON CONTROLLED PAPER STOCK

Lab. No. 4372c

Date Rec'd. 3-24-34

Date Sampled 3-24-34

Sampled By Yourselves

STANDARD LABORATORIES, INC.

Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Sample ID: P1 Existing Topsoil Stockpile

ACID-BASE ACCOUNTABILITY

				$CaCO_3$ Equiv. (Tons/1000 Tons Material)		
Color	Paste pH	Fizz	% Sul.	Max from % Sul.	Amount Present	Excess
10YR7/2	7.95	5	< 0.001	< 0.03	290.00	289.97

NUTRIENTS:

Phosphorus = 18.7 pp2m (Sodium Bicarbonate Extractable)

Magnesium = 0.50 Tons/1000 Tons material (Double Acid Extractable)

Potassium = 0.05 Tons/1000 Tons material (Double Acid Extractable)

Calcium = 8.3 Tons/1000 Tons material (Double Acid Extractable)

Nitrate-N = 180 ppm (Phenoldisulfonic Acid Method)

Respectfully Submitted

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AUG 20 1984

Lab. No. 43727

Date Rec'd. 3-24-84

Date Sampled 3-24-84

Sampled By Yourselves

STANDARD LABORATORIES, INC.

Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Sample ID: P2 Loadout Alternative Soil Substitute

ACID-BASE ACCOUNTABILITY

Color	Paste pH	Fizz	% Sul.	$CaCO_3$ Equiv. (Tons/1000 Tons Material) Max from % Sul	Amount Present	Excess
10yr7/2	7.50	5	<0.001	< 0.03	226.43	226.40

NUTRIENTS:

Phosphorus = 24.0 ppm (Sodium Bicarbonate Extractable)

Magnesium = 0.52 Tons/1000 Tons material (Double Acid Extractable)

Potassium = 0.05 Tons/1000 Tons material (Double Acid Extractable)

Calcium = 8.4 Tons/1000 Tons material (Double Acid Extractable)

Nitrate-N = 1400 ppm (Phenoldisulfonic Acid Method)

Respectfully Submitted

FOR YOUR PROTECTION THIS DOCUMENT HAS BEEN PRINTED ON CONTROLLED PAPER STOCK

AUG 20 1984

April 24, 1985

Wendell Owen
Co-op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Dear Mr. Owen:

Pursuant to your request, please be advised that C.O.P. Coal Development Company hereby grants permission to Co-op Mining Company to store top soil, as needed or requested by the State of Utah, on C.O.P. property in the ball park area at Bear Canyon.

C.O.P. COAL DEVELOPMENT CO.

BY Joseph A. Kingston
Vice President

RECEIVED
MAY 7 1985

Inter-Mountain Laboratories, Inc.
2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CO-OP Mining Company
Huntington, UT
MINE: Bear Canyon Mine

Date reported: May 25, 1989

Lab No	Location	Depths	pH	EC mmhos/cm @ 25C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
3998	PR-1	0.0-0.0	7.9	3.61	30.1	11.5	22.2	12.2	2.97	21.0	56.4	30.3	13.3	SANDY LOAM
3999	PR-2	0.0-0.0	7.8	2.74	33.5	13.2	15.7	5.27	1.39	33.1	56.0	32.5	11.5	SANDY LOAM
4000	BP-1	0.0-0.0	7.8	3.28	34.9	16.5	20.2	5.60	1.31	30.1	49.6	37.1	13.3	LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.
2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CO-OP Mining Company
Huntington, UT
MINE: Bear Canyon Mine

Date reported: May 25, 1989

Lab No.	Location	Depths	Organic Carbon %	Carbonate %	P ppm	K ppm	Nitrate-Nitrogen ppm	Alkalinity PE meq/l	Total Kjeldahl Nitrogen %	1/3 bar %	15 bar %
3998	PR-1	0.0-0.0	0.70	25.8	1.10	44.0	4.64	2.11	0.06	14.71	4.96
3999	PR-2	0.0-0.0	2.6	28.3	1.84	49.0	2.84	2.24	0.05	18.48	7.08
4000	BP-1	0.0-0.0	0.58	21.9	2.98	86.0	30.6	2.15	0.08	19.20	6.75

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble,ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: March 13, 1992

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
16326	REF-2	0-4	7.4	0.80	31.9	6.55	1.05	0.46	0.24	3.2	59.6	34.0	6.4	SANDY LOAM
16327		4-8	7.4	1.70	35.0	17.9	1.00	0.41	0.13	3.8	50.5	43.1	6.4	SANDY LOAM
16328		8-24	7.3	2.81	32.0	29.8	8.70	0.66	0.15	6.6	52.4	40.3	7.3	SANDY LOAM
16329		24-36	7.4	2.76	30.4	29.5	8.64	0.64	0.15	16.6	51.5	40.3	8.2	LOAM
16330	REF-3	0-4	7.7	0.63	22.1	4.53	1.64	0.92	0.52	55.0	75.1	20.4	4.5	LOAMY SAND
16331		4-8	7.7	0.58	23.1	3.94	1.86	0.91	0.53	29.9	69.6	24.0	6.4	SANDY LOAM
16332		8-24	7.5	1.52	25.4	11.6	7.62	1.31	0.42	26.5	59.6	31.3	9.1	SANDY LOAM
16333		24-36	7.5	1.41	25.5	10.3	7.74	1.25	0.42	30.3	63.3	28.5	8.2	SANDY LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: March 13, 1992

Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Total Kjeldahl Nitrogen %	1/3 bar	15 bar	Water Retention Difference in/in*
16326	REF-2	0-4	1.2	20.7	4.10	0.65	3.83	1.5	0.06	12.3	5.6	0.1
16327		4-8	1.3	20.4	2.14	0.52	3.76	1.4	0.09	14.2	6.3	0.1
16328		8-24	0.6	21.5	1.27	0.98	3.30	1.5	0.06	13.6	6.3	0.1
16329		24-36	0.4	21.8	1.16	1.00	2.98	1.5	0.06	13.0	6.3	0.1
16330	REF-3	0-4	1.5	23.4	1.42	0.31	3.57	1.7	0.04	8.5	4.3	<0.1
16331		4-8	0.8	25.8	1.16	0.24	3.71	1.5	0.03	9.5	4.6	0.1
16332		8-24	0.7	31.4	1.57	0.34	4.01	1.9	0.04	13.0	6.0	0.1
16333		24-36	0.7	29.3	0.98	0.37	3.98	1.8	0.04	12.1	5.6	0.1

* Air dry bulk density was substituted for 1/3 bar bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

MANGUM ENGINEERING
KAYSVILLE, UTAH
MINE: CO-OP

DATE REPORTED: January 8, 1993

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments > 2 mm, % by Vol.	Sand %	Silt %	Clay %	Texture
24432	TSA-1	0-6	7.3	1.09	38.4	8.37	4.00	1.60	0.64	32.0	41.5	36.7	21.8	LOAM
24433		6-12	7.8	1.33	40.2	3.80	6.70	3.50	1.53	2.6	15.1	59.4	25.5	SILT LOAM
24434		12-24	8.1	4.48	42.3	2.88	30.1	18.9	4.66	7.7	11.5	61.2	27.3	SILTY CLAY LOAM
24435	TSA-2	0-6	7.4	0.73	32.2	4.77	1.94	1.45	0.79	52.9	40.5	41.3	18.2	LOAM
24436		6-12	7.5	0.76	31.2	4.48	2.91	1.50	0.78	66.7	33.3	46.7	20.0	LOAM
24437		12-24	7.5	0.85	27.8	4.64	4.10	1.37	0.66	73.5	40.5	43.1	16.4	LOAM
24438	TSA-3	0-6	7.5	0.58	25.4	3.83	1.85	1.24	0.74	61.1	58.7	26.8	14.5	SANDY LOAM
24439		6-12	7.8	0.61	31.3	2.49	3.62	1.33	0.76	60.0	26.9	45.8	27.3	CLAY LOAM
24440		12-24	7.9	0.73	29.2	1.88	4.70	1.27	0.70	59.8	40.5	37.7	21.8	LOAM
24441	TSA-4	0-6	7.6	0.92	28.2	6.47	2.51	1.32	0.62	54.3	64.2	26.7	9.1	SANDY LOAM
24442		6-12	7.5	1.07	27.3	5.96	4.72	1.48	0.64	42.4	58.7	28.6	12.7	SANDY LOAM
24443		12-24	7.7	8.67	27.5	25.4	75.1	20.5	2.89	67.7	38.7	43.1	18.2	LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter·Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

MANGUM ENGINEERING
KAYSVILLE, UTAH
MINE: CO-OP

DATE REPORTED: January 8, 1993

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments > 2 mm, % by Vol.	Sand %	Silt %	Clay %	Texture
24432	TSA-1	0-6	7.3	1.09	38.4	8.37	4.00	1.60	0.64	32.0	41.5	36.7	21.8	LOAM
24433		6-12	7.8	1.33	40.2	3.80	6.70	3.50	1.53	2.6	15.1	59.4	25.5	SILT LOAM
24434		12-24	8.1	4.48	42.3	2.88	30.1	18.9	4.66	7.7	11.5	61.2	27.3	SILTY CLAY LOAM
24435	TSA-2	0-6	7.4	0.73	32.2	4.77	1.94	1.45	0.79	52.9	40.5	41.3	18.2	LOAM
24436		6-12	7.5	0.76	31.2	4.48	2.91	1.50	0.78	66.7	33.3	46.7	20.0	LOAM
24437		12-24	7.5	0.85	27.8	4.64	4.10	1.37	0.66	73.5	40.5	43.1	16.4	LOAM
24438	TSA-3	0-6	7.5	0.58	25.4	3.83	1.85	1.24	0.74	61.1	58.7	26.8	14.5	SANDY LOAM
24439		6-12	7.8	0.61	31.3	2.49	3.62	1.33	0.76	60.0	26.9	45.8	27.3	CLAY LOAM
24440		12-24	7.9	0.73	29.2	1.88	4.70	1.27	0.70	59.8	40.5	37.7	21.8	LOAM
24441	TSA-4	0-6	7.6	0.92	28.2	6.47	2.51	1.32	0.62	54.3	64.2	26.7	9.1	SANDY LOAM
24442		6-12	7.5	1.07	27.3	5.96	4.72	1.48	0.64	42.4	58.7	28.6	12.7	SANDY LOAM
24443		12-24	7.7	8.67	27.5	25.4	75.1	20.5	2.89	67.7	38.7	43.1	18.2	LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

MANGUM ENGINEERING
KAYSVILLE, UTAH
MINE: CO-OP

DATE REPORTED: January 8, 1993

Lab No.	Location	Depths	Carbonate %	Organic Carbon %	P mg/kg	K PE meq/l	Alkalinity PE meq/l	Bulk Density g/cm3	Total Kjeldahl Nitrogen %	1/3 bar	15 bar	Available Water Capacity, in/in	Munsell Color Crushed-dry
24432	TSA-1	0-6	45.0	2.3	4.04	0.95	8.23	2.12	0.11	12.4	8.6	0.05	10YR 5/3
24433		6-12	57.4	1.0	0.85	1.25	5.02	1.99	0.06	16.5	9.5	0.14	10YR 7/2
24434		12-24	59.2	0.6	0.38	2.48	3.47	1.98	0.04	15.9	9.9	0.11	10YR 7/2
24435	TSA-2	0-6	48.8	2.0	1.08	0.35	5.25	1.93	0.08	11.4	6.1	0.05	10YR 7/3
24436		6-12	50.0	1.4	0.71	0.23	4.75	1.54	0.05	10.7	4.8	0.03	10YR 7/3
24437		12-24	50.6	1.0	1.42	0.24	3.96	2.24	0.04	10.3	4.5	0.07	10YR 6/3
24438	TSA-3	0-6	23.2	1.4	0.76	0.19	4.13	1.95	0.04	7.0	4.0	0.02	10YR 7/3
24439		6-12	9.2	1.1	0.22	0.20	3.20	2.19	0.03	10.0	6.3	0.03	10YR 7/2
24440		12-24	34.2	0.7	0.27	0.09	3.47	1.89	0.03	10.6	6.0	0.03	10YR 7/2
24441	TSA-4	0-6	27.8	3.4	1.80	0.47	6.45	1.78	0.10	6.9	3.8	0.03	10YR 6/3
24442		6-12	30.6	1.9	1.04	0.45	6.68	1.27	0.06	8.2	4.5	0.03	10YR 6/3
24443		12-24	45.4	2.0	0.27	1.08	2.80	1.88	0.05	10.4	5.4	0.03	10YR 6/3

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble,ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

Appendix 2-B

PRIME FARM LAND

United States
Department of
Agriculture

Soil
Conservation
Service

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

January 28, 1991

Kimly C. Mangum
Mangum Engineering Consultants
388 East Boynton Road
Kaysville, Utah 84037

Dear Sir:

We have completed a review of the area (section 13,14,23,24,26 and the W1/2 of section 25 T16S., Range 7E in Carbon County, Utah) as requested in your letter of January 15, 1991 concerning Important Farmlands.

There were no Important Farmlands identified in this site. The soils were eliminated because of the lack of irrigation water, rock fragments greater than 3 inches in size comprising more than 10 percent of the soil surface and erodibility factors greater than 2.

Enclosed is the completed Form AD1006 and the previous documentation furnished with your inquiry.

Thank you for calling on us. If we can be of further assistance please give us a call.

Sincerely,

Ferris Allgood

Ferris P. Allgood
State Soil Scientist

Enclosure

cc: (w/o encl)
Jan C. Anderson, DC, SCS,Price, Utah

United States Department of Agriculture
Soil Conservation Service
350 North 4th East
Price, Utah 84501

SUBJECT: PRIME FARMLAND DETERMINATIONS

DATE: January 15, 1991

TO: FERRIS P. ALLGOOD, SSS, SCS, SLC,UT

REFERENCE: Prime Farmlands Bear Canyon Mine Operation Area, Co-op Mining Co. Emery County Utah, Mangum Engineering Consultants 388 East Boynton Road, Kaysville, Utah 84037

After site investigation, the Soil Conservation Service has determined that no prime farmland or farmland of statewide importance occurs on:

Permit Area Sections 13, 14, 23, 24, 26 and the W½ of Section 25T16S.R7E SLM.

for the following reason(s):

1. The soils do not have an available source of irrigation water.

2. Rock fragments larger than 3" comprise more than 10% of the soil surface.

3. Excessive slope, % slope x erodibility factor is greater than 2.

Location map is enclosed.

REMARKS: No location map provided.

Jan C. Anderson

District Conservationist

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request
Name Of Project: Bear Canyon Mine Operation, Co-op Mining Co.	Federal Agency Involved: Utah Department of Oil, Gas and Mining
Proposed Land Use: Mining Operation	County And State: Emery, Utah
PART II *(To be completed by SCS)*	Date Request Received By SCS: January 9, 1991

Does the site contain prime, unique, statewide or local important farmland? Yes ☐ No ☒
(If no, the FPPA does not apply – do not complete additional parts of this form)

Acres Irrigated	Average Farm Size
None	

Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined in FPPA
None	Acres: %	Acres: %
Name Of Land Evaluation System Used	**Name Of Local Site Assessment System**	**Date Land Evaluation Returned By SCS**
Soil Survey		

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly				
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site				
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*				

PART VI *(To be completed by Federal Agency)* Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local site assessment)*	160				
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

Form AD-1006 (10-83)

USDA Natural Resources Conservation Service

350 North 400 East
Price, Utah 84501
801-637-0041

DATE: July 9, 1999

FILE CODE: 290-11-11-5

SUBJECT: PRIME FARMLAND DETERMINATIONS

TO: Charles Reynolds, P.E.
Environmental Coordinator
CO-OP Mining Company
P.O. Box 1245
Huntington, UT 84528

RE: Wild Horse Ridge and Fish Creek Canyon

After site investigation, the Natural Resources Conservation Service has determined that no prime farmland or farmland of statewide importance occurs on the Wild Horse Ridge area located in sections 24 or 25 T.16S. R.7E. and sections 19 and 30 T.16S. R.8E. as outlined on the map.

The soils have steep slopes so that (erodibility factor)K x percent slope exceeds 2.

Location map is enclosed.

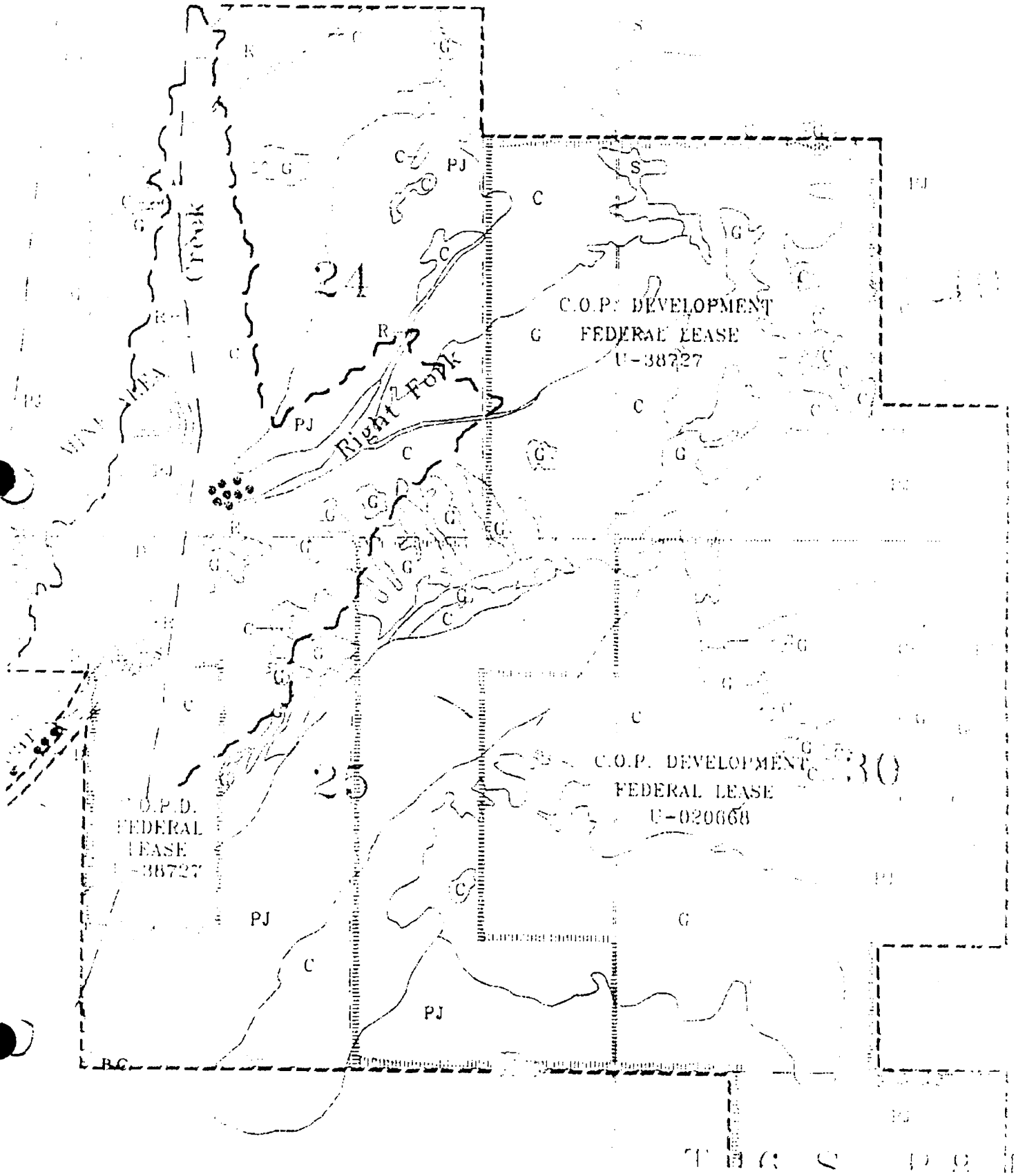
Remarks: There are alluvial soils in the bottoms of Fish Creek Canyon and the right fork of Bear Creek in the area outlined on the map. These areas can be very narrow and are adjacent to these small streams.

Leland Sasser

Leland Sasser
Soil Scientist

Attachment

cc: William Broderson, State Soil Scientist, NRCS, UT


24
25
Right Fork
C.O.P. DEVELOPMENT
FEDERAL LEASE
U-38727
C.O.P. DEVELOPMENT
FEDERAL LEASE
U-020668
C.O.P.D.
FEDERAL
LEASE
U-38727
PJ
C
G
S

Appendix 2-C

SUBSTITUTE TOPSOIL MATERIAL (DOWNCAST)

INTRODUCTION

No topsoil material was removed to a designated topsoil storage area from the portal access road and adjacent areas due to the prelaw nature of the disturbance. The native material available as downcast material has been designated as a substitute to be used during reclamation. In order to show that the material is suitable for reclamation as substitute topsoil material the procedures discussed below have been defined and are to be followed as described.

Tests of the same material were taken in 1984 (See Appendix 2-A) and all results indicated that the material was compatible and capable of establishing and maintaining a diverse vegetative community consistent with the reference area.

DEFINITION OF AREA

The substitute topsoil material is located at the nearest approx 20 ft of surface material 0 to 2 ft deep along the downhill side of the referenced portal access road shown on Plate 5-2. A typical section of the area showing the reclamation procedure is shown in Figure 5-4 and described in R645-301-542.200.

PHYSICAL AND CHEMICAL PROPERTIES OF SOIL

Soil samples (PR-1 and PR-2) were taken 12 April 1989 as selected by DOGM representative Henry Sauer, along the access road. The results are included in Appendix 2-A (Page 2A-11 and 2A-12) and have been found suitable as plant growth material. Samples were tested following the guidelines in Table 1 from the State of Utah, Department of Natural Resources, Division of Oil Gas and Mining, Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. See Table 2-7.

REVEGETATION TRIAL TESTING

In order to further verify the suitability of the substitute topsoil material revegetation field testing will be performed as requested by DOGM.

1. An on-site survey will be made in the summer of 1989 by a representative of Co-Op and DOGM to determine areas that require additional seeding due to recent disturbances. Much of the area has revegetated since the original disturbance.

2. Areas that require additional seeding will be hydroseeded during the fall of 1989 using the Pinyon Juniper Grass, grass and forbs seed mix recommended in R645-301-341, Table 3-7. Tack to fiber ratios, rate of application of wood fiber mulch and fertilizer will be applied as defined in R645-301-341, Table 3-8. In 1990 it was determined by DOGM that areas should be reseeded. Seeding will be completed in the fall of 1990.

3. A 30 ft x 50 ft test plot area, near the Hiawatha Portal, was selected by DOGM representative Henry Sauer, in August 1989. The test plot will be marked at each corner with a metal post. Monitoring will be completed for a period of 10 years or until applicable vegetation standards are met following the procedures defined in R645-301-341.250.

RECLAMATION

This material will not be disturbed until required for redistribution during reclamation except as required to maintain the immediate roadside berm. Reclamation will be followed as defined in R645-301-240, Appendix 5-F and other applicable section of this plan.

Appendix 2-D

IN-PLACE PLANT GROWTH MATERIAL

INTRODUCTION

The following pages are a copy of a report prepared by Patrick Collins, Ph.D., Biologist/Reclamation Specialist, of Mt Nebo Scientific. The report reviews results of testing made on soil samples collected in 1991 at Bear Canyon Mine. The report recommends use of the in-place spoils for effective and relatively inexpensive reclamation procedures.

Soil sample test results are included at the end of the report.

Prepared by

MT. NEBO SCIENTIFIC RESEARCH & CONSULTING
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

for

CO-OP MINING COMPANY
Huntington, Utah 84528

and

MANGUM ENGINEERING CONSULTANTS
388 East Boynton Road
Kaysville, Utah 84037

March 19, 1992

REVIEW OF PLANT GROWTH MATERIAL FOR RECLAMATION IN BEAR CANYON FOR THE CO-OP MINE

METHODS

Soil sample were collected by representatives of the CO-OP Mining Company in coordination with the State of Utah, Division of Oil, Gas & Mining (DOGM). These soil samples were taken in an attempt to evaluate existing plant growth material in the area that could be used at the time of final reclamation of the mine site.

This report is the result of an evaluation of the laboratory results form the sampling. Copies of the original laboratory results form which this report was based are included in the Appendix.

Several disturbed areas that will be reclaimed and other potential borrow and reference areas near the mine site were sampled. For distinction in this study the disturbed soils sampled were referred to as "spoils", whereas the borrow and reference areas were called "native soils".

The following parameters were analyzed form different soil depths at Inter-Mountain Laboratories, Inc., Farmington, New Mexico:

PH
EC
Saturation
Calcium
Magnesium
Sodium
SAR
Coarse Fragments
Sand, Silt, Clay (Texture)
Organic Matter
Carbonate
Phosphorus
Potassium
Alkalinity
Bulk Density
Water Retention Difference
Total Kjeldahl Nitrogen

Data from the soils laboratory report were entered on another speadsheet to facilitate comparisons and statistical analysis. Sample areas were summarized and reviewed independently, then compared to other area spoils and native soils.

RESULTS

There are basically two alternatives for reclamation on some of the disturbed areas of the mine site. One alternative is to use "in-place" spoils for the plant growing medium, whereas the use "in-place" spoils for the plant growing medium, whereas the other alternative would be to use "substitute" material form borrow areas .

Sample Identification

The soils tested were from both in-place spoils and borrow area (native) soils. Table 1 provides abbreviations that correspond to the soil reports, data summaries and CO-OP location maps. Sample test location are shown on CO-OP Plates 2-A through 2-5D.

Table 2, taken form the lab report shown in the Appendix, shows specific parameter results for each area.

Area By Area Comparisons

The soils lab report was initially reviewed to detect obvious departures from limits adequate for potential plant growing medium. Next, the areas were picked out of the lab report (see Appendix) and put in a format to facilitate area-by-area comparisons of selected parameters for the native soils and spoils. Average (Mean), standard deviations (Std. Dev.) and sample sizes (n) were listed. Therefore, one can look at this table and easily compare the mean differences for the listed parameters.

No anomalies, problems or departures form limits that should inhibit revegetation success were observed.

TABLE 1: Sample Identification Numbers

NATIVE SOILS	DISTURBED SPOILS
REFERENCE AREA REP-1	SHOP PAD SP-1 SP-2
LOWER BORROW AREA LB-1 LB-2 LB-3	SEDIMENT POND A SEDA-1 SEDA-2
TOPSOIL PILE TSP-1 TSP-2	SEDIMENT POND B SEDB-1 SEDB-2
	UPPER STORAGE PAD USP-1
	COAL STORAGE PAD CSP-1 CSP-3 CSP-4 CSP-5
	UNNAMED LHP-1 PAR-1
	SCALEHOUSE SHP-1 SHP-1

Native vs. Spoils

Table 2 shows all of the native soils grouped together (n=22) plus all of the spoils in another group (n=65). Group comparison tests showed some statistically significant differences when the spoils were compared with the native soil samples of the areas (Table 2-6). However, even if differences were noted, the spoils were still within the limits that would favor successful growing medium for final reclamation.

Recommendations

This data suggests that no significant problems exist in the spoils that were sampled. Futhermore, when compared with the native soils, the spoils did not seem to differ drastically. Therefore, it is recommended that the "in-place" spoils be used for the plant growth material at the time of final reclamation rather than borrowing soils form other sites. Some amendments (e.g. fertilizer) may still need to be added to the spoils at the time of final reclamation.

It should be noted, however, that this recommendation can only be made to the depth of the soil samples. There is no way to make inferences about the spoils in depths lower than that which was sampled. In other words, calculations should be made to substantiate the volumes of soil (spoil) required for adequate cover of the area to be seeded. To be confident that growing medium should provide adequate revegetation

success, the soil (spoil) used should only be used to the depth sampled. If grater volumes are needed, samples should be taken to a greater depth or borrow soil utilized.

The following analysis should be taken (but not limited to) at the time of final reclamation and prior to reseeding: pH, organic carbon, electrical conductivity, sodium absorption ratio, and rock fragments. These recommendations assume the area will be fertilized with nitrogen, phosphorus, and potassium at the time of final reclamation.

TABLE 2: Raw data from all sample areas.

NATIVE SOILS RAW DATA

	pH	EC	SAT.%	SAR	C.F.%	DM%	Carb.	P	K	Alka.
REP-1	7.60	0.63	27.70	0.66	18.30	0.40	23.80	8.39	0.64	1.70
	7.90	0.65	28.00	0.54	40.20	0.10	28.50	1.82	0.62	5.13
	8.10	0.52	24.10	0.50	2.60	0.10	23.50	1.00	0.48	3.67
	8.00	0.97	22.90	0.52	52.70	0.10	24.50	1.42	0.81	3.91
LB-1	7.80	1.24	39.50	0.88	17.70	2.40	19.20	2.37	0.73	4.22
	8.00	0.71	27.70	0.42	55.70	0.50	18.60	0.25	0.52	2.76
	8.00	1.05	30.50	0.39	58.80	0.90	22.70	0.53	0.47	3.39
	8.20	0.69	25.50	0.57	72.70	0.50	23.20	0.25	0.14	3.25
	7.90	5.08	29.70	0.57	30.30	0.90	18.60	0.49	0.49	2.23
LB-2	7.90	0.67	35.60	0.33	27.00	0.70	18.80	0.60	0.16	3.58
	7.90	0.58	30.30	0.46	54.10	0.60	18.30	0.18	0.13	3.28
	7.90	0.67	26.90	0.51	77.10	0.70	23.30	0.27	0.15	4.42
	8.10	0.52	29.80	0.38	40.50	2.20	22.50	0.11	0.09	3.77
	8.00	2.38	29.90	0.39	32.50	0.60	18.70	0.16	0.22	2.34
LB-3	7.90	0.66	35.00	1.00	63.50	2.80	19.10	0.76	0.29	3.85
	7.90	0.46	33.10	0.63	45.70	1.40	19.00	0.34	0.16	3.25
	8.10	0.44	28.40	0.52	72.30	0.80	22.70	0.23	0.17	3.44
	7.90	3.36	28.80	0.69	42.60	0.80	22.60	0.05	0.40	2.34
TSP-1	7.90	0.50	30.00	0.52	52.80	1.10	21.10	1.73	0.35	3.50
	8.00	0.52	29.20	0.48	36.10	0.20	23.80	1.03	0.32	4.08
TSP-2	7.80	0.05	32.00	0.36	18.80	0.80	15.20	2.47	0.61	4.66
	8.00	0.55	32.30	0.52	22.60	0.30	19.90	1.19	0.36	3.70

TABLE 2: (continued)

DISTURBED SPOILS RAW DATA

	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
SP-1	7.80	1.61	25.40	1.20	35.70	0.10	21.60	1.38	0.43	2.59
	7.80	1.51	28.60	1.19	39.40	0.70	21.00	1.59	0.43	2.60
SP-2	7.90	4.11	30.00	1.56	31.90	0.30	20.70	1.24	0.45	2.25
	7.70	4.05	29.20	1.62	25.10	0.40	18.70	3.95	0.78	2.58
SEDA-1	7.80	3.67	24.40	1.03	43.60	2.90	24.40	0.77	0.53	2.26
	8.00	1.02	24.10	1.03	42.40	0.30	24.50	0.93	0.27	3.41
SEDA-2	7.90	0.92	23.50	0.93	46.40	2.70	24.10	0.88	0.53	3.72
	7.70	4.23	24.10	1.05	37.70	3.70	23.70	0.91	0.56	2.50
SEDB-1	7.80	1.63	25.30	0.73	33.60	1.60	23.90	2.22	1.14	4.10
	7.90	5.03	23.60	2.00	36.70	0.80	24.20	0.95	0.82	2.56
	7.90	6.52	23.30	2.38	47.70	2.00	23.90	1.14	0.87	2.42
SEDB-2	7.60	2.68	40.20	0.85	45.50	7.60	23.70	4.05	1.87	6.07
	7.80	6.24	27.20	1.22	20.50	1.40	29.00	0.78	0.62	2.00
USP-1	7.80	4.60	33.60	2.49	48.20	1.60	34.30	1.11	1.23	1.40
	7.90	2.43	30.30	1.06	36.10	0.80	31.80	0.86	1.05	1.43
	8.10	1.36	27.40	1.53	78.10	0.50	30.10	0.92	0.95	2.08
	8.00	1.47	27.50	1.31	50.90	0.60	29.40	0.78	1.15	1.87
	7.90	2.89	29.10	0.97	46.80	0.90	31.30	1.23	1.41	1.52
	7.90	2.73	28.90	0.90	52.70	1.50	43.70	1.01	1.05	1.64
	8.10	1.86	29.80	0.89	57.30	0.80	37.10	0.97	0.81	1.68
	8.00	1.99	29.20	0.98	67.10	1.00	37.60	1.30	0.83	1.90
	8.00	2.38	28.80	0.86	63.30	0.30	35.60	1.01	0.94	1.64
	8.00	2.10	30.30	0.93	59.40	0.30	34.70	0.67	0.74	2.11
	8.10	2.08	28.60	1.02	62.90	0.30	35.50	0.86	0.75	1.92
CSP-1	7.90	1.64	28.70	1.07	53.50	3.80	30.70	0.60	0.39	1.94
	7.90	4.18	29.50	0.90	55.00	4.10	29.50	0.56	0.45	1.78
	7.90	5.04	29.80	1.16	62.20	4.20	30.10	0.69	0.50	1.85
	7.90	3.20	31.10	0.51	53.30	4.60	30.90	0.67	0.54	1.66
CSP-3	8.00	1.34	33.10	0.33	53.30	2.30	34.60	0.76	0.33	3.14
	8.10	1.21	31.00	0.43	59.40	1.80	33.00	0.52	0.26	2.30
	8.10	1.15	28.60	0.61	60.30	0.50	34.40	0.46	0.28	2.39
	8.10	2.57	28.70	0.43	70.10	0.50	37.90	0.55	0.74	2.13
	7.80	3.51	29.00	0.35	64.30	1.00	34.00	0.59	0.75	1.66
	7.80	3.42	28.70	0.38	62.50	1.50	10.80	0.70	0.62	1.52

TABLE 2: (continued)

DISTURBED SPOILS RAW DATA (continued)

	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
CSP-4	7.80	3.71	32.30	0.54	45.20	5.80	25.00	0.50	0.56	1.61
	7.80	3.86	30.50	0.56	49.10	5.80	23.10	0.55	0.61	1.59
	7.90	3.79	31.50	0.83	63.60	5.50	21.60	0.53	0.62	1.71
	7.80	3.81	32.00	0.53	60.20	5.50	22.80	0.52	0.60	1.66
	7.70	3.44	30.70	0.45	54.30	5.50	22.80	0.65	0.61	1.90
	7.70	3.51	31.70	0.51	55.70	5.60	21.70	0.75	0.55	1.85
CSP-5	8.10	1.32	29.10	0.65	60.20	1.40	23.70	0.58	0.16	1.61
	8.10	1.43	29.40	0.66	33.30	1.00	18.80	0.48	0.18	2.08
	8.00	1.84	36.10	0.66	58.60	2.90	23.30	0.54	0.21	1.66
	8.00	1.81	26.30	0.88	38.00	0.70	23.90	0.36	0.20	1.59
	8.00	2.53	25.60	0.95	63.00	0.50	24.50	0.32	0.18	1.45
	8.00	3.70	27.20	0.61	46.00	0.50	21.90	0.65	0.16	1.19
LHP-1	7.60	2.60	31.70	4.09	47.90	5.50	45.00	7.00	0.46	6.08
	8.10	3.11	34.30	4.89	52.10	0.80	46.50	5.12	0.29	1.98
	8.20	2.39	36.30	4.02	44.10	0.80	28.90	0.61	0.20	2.52
	8.20	2.91	33.80	4.96	33.30	0.50	28.40	0.59	0.15	2.57
	8.20	3.90	35.10	4.88	47.90	0.30	29.40	0.76	0.26	2.00
	8.20	2.04	31.70	3.19	42.00	0.70	28.20	0.59	0.27	2.36
	8.20	2.09	26.30	3.17	35.30	0.80	18.30	0.72	0.28	2.43
PAR-1	8.00	1.18	25.20	2.26	44.80	1.00	20.60	1.09	0.59	2.84
	8.10	1.07	25.20	2.87	52.50	1.80	24.10	1.26	0.58	2.90
	7.80	1.86	30.10	0.79	47.80	1.30	29.00	0.95	0.93	2.34
	7.80	1.63	30.60	0.28	40.00	1.00	31.60	0.73	0.69	2.47
	8.20	3.51	44.20	1.14	38.50	2.00	31.10	0.85	0.73	3.73
SHP-1	7.50	5.64	22.90	8.02	61.40	2.10	23.80	0.19	0.51	2.11
	7.50	2.97	28.90	1.48	38.20	1.60	21.00	0.32	0.85	2.01
	7.60	2.36	28.30	1.43	45.30	1.40	21.40	0.30	0.81	2.23
SHP-2	7.80	4.68	27.60	7.98	53.10	2.80	21.90	0.17	0.38	1.83
	7.70	3.58	29.20	4.76	32.40	1.50	23.20	0.17	0.35	1.76
	8.00	1.22	29.60	1.36	18.30	0.70	23.40	0.10	0.27	2.49
	7.90	2.65	26.60	1.68	30.80	0.90	27.90	0.08	0.68	1.73

TABLE 3: Soil sample results (area-by-area comparisons).

NATIVE SOILS Area by Area Comparisons

	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
REP-1										
n=	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mean=	7.90	0.69	25.68	0.56	28.45	0.18	25.08	3.16	0.64	3.60
Std.Dev.=	0.19	0.17	2.22	0.06	19.35	0.13	2.01	3.03	0.12	1.23
LB-1										
n=	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Mean=	7.98	1.75	30.58	0.57	47.04	1.04	20.46	0.78	0.47	3.17
Std.Dev.=	0.13	1.68	4.78	0.17	20.06	0.70	2.05	0.80	0.19	0.66
LB-2										
n=	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Mean=	7.96	0.96	30.50	0.41	46.24	0.96	20.32	0.26	0.15	3.48
Std.Dev.=	0.08	0.71	2.82	0.06	17.92	0.62	2.13	0.18	0.04	0.68
LB-3										
n=	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mean=	7.95	1.23	31.33	0.71	56.03	1.45	20.85	0.35	0.26	3.22
Std.Dev.=	0.09	1.23	2.81	0.18	12.32	0.82	1.80	0.26	0.10	0.55
TSP-1										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.95	0.51	29.60	0.50	44.45	0.65	22.45	1.38	0.34	3.79
Std.Dev.=	0.05	0.01	0.40	0.02	8.35	0.45	1.35	0.35	0.01	0.29
TSP-2										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.90	0.30	32.15	0.44	20.70	0.55	17.55	1.83	0.49	4.18
Std.Dev.=	0.10	0.25	0.15	0.08	1.90	0.25	2.35	0.64	0.12	0.48

TABLE 3: (continued)

DISTURBED SPOILS Area by Area Comparisons

	pH	EC	SAT.%	SAR	C.F.%	DMX	Carb.	P	K	Alka.
SP-1										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.80	1.56	27.00	1.20	37.55	0.40	21.30	1.49	0.43	2.60
Std. Dev.=	ERR	0.05	1.60	0.00	1.85	0.30	0.30	0.10	ERR	0.00
SP-2										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.80	4.08	29.60	1.59	28.50	0.35	19.70	2.60	0.62	2.42
Std. Dev.=	0.10	0.03	0.40	0.03	3.40	0.05	1.00	1.35	0.17	0.16
SEDA-1										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.90	2.35	24.25	1.03	43.00	1.60	24.45	0.85	0.40	2.84
Std. Dev.=	0.10	1.32	0.15	ERR	0.60	1.30	0.05	0.08	0.13	0.58
SEDA-2										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.80	2.58	23.80	0.99	42.05	3.20	23.90	0.90	0.55	3.11
Std. Dev.=	0.10	1.66	0.30	0.06	4.35	0.50	0.20	0.01	0.02	0.61
SEDB-1										
n=	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mean=	7.87	4.39	24.07	1.70	39.33	1.47	24.00	1.44	0.94	3.03
Std. Dev.=	0.05	2.05	0.88	0.71	6.05	0.50	0.14	0.56	0.14	0.76
SEDB-2										
n=	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Mean=	7.70	4.46	33.70	1.04	33.00	4.50	26.35	2.42	1.25	4.04
Std. Dev.=	0.10	1.78	6.50	0.19	12.50	3.10	2.65	1.64	0.62	2.03
USP-1										
n=	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Mean=	7.98	2.35	29.41	1.18	56.62	0.78	34.65	0.97	0.99	1.74
Std. Dev.=	0.09	0.84	1.61	0.46	10.87	0.43	3.88	0.18	0.20	0.24
CSP-1										
n=	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mean=	7.90	3.52	29.78	0.91	56.00	4.18	30.30	0.63	0.47	1.81
Std. Dev.=	ERR	1.26	0.86	0.25	3.64	0.29	0.55	0.05	0.06	0.10

TABLE 3: (continued)

DISTURBED SPOILS Area by Area Comparisons (continued

	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
CSP-3										
n=	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Mean=	7.98	2.20	29.85	0.42	61.65	1.27	30.78	0.60	0.50	2.19
Std. Dev.=	0.13	1.01	1.67	0.09	5.10	0.66	9.06	0.10	0.21	0.53
CSP-4										
n=	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Mean=	7.78	3.69	31.45	0.58	54.68	5.62	22.83	0.58	0.59	1.72
Std. Dev.=	0.07	0.16	0.65	0.14	6.22	0.13	1.12	0.09	0.03	0.12
CSP-5										
n=	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Mean=	8.03	2.11	28.95	0.74	49.85	1.17	22.68	0.49	0.18	1.60
Std. Dev.=	0.05	0.81	3.48	0.13	11.44	0.84	1.91	0.12	0.02	0.27
LHP-1										
n=	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Mean=	8.10	2.72	32.74	4.17	43.23	1.34	32.10	2.20	0.27	2.85
Std. Dev.=	0.21	0.61	3.06	0.72	6.39	1.71	9.34	2.49	0.09	1.34
PAR-1										
n=	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Mean=	7.98	1.85	31.06	1.47	44.72	1.42	27.28	0.98	0.70	2.86
Std. Dev.=	0.16	0.88	6.96	0.96	5.12	0.41	4.26	0.18	0.13	0.49
SHP-1										
n=	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mean=	7.53	3.66	26.70	3.64	48.30	1.70	22.07	0.27	0.72	2.12
Std. Dev.=	0.05	1.42	2.70	3.09	9.71	0.29	1.24	0.06	0.15	0.09
SHP-2										
n=	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Mean=	7.85	3.03	28.25	3.95	33.65	1.48	24.10	0.13	0.42	1.95
Std. Dev.=	0.11	1.27	1.21	2.68	12.49	0.82	2.27	0.04	0.16	0.31

TABLE 4: Group comparisons of the soil sample areas.

NATIVE SOILS Total Group Comparisons

A.	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
TOTAL										
n=	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Mean=	7.95	1.04	29.86	0.54	42.48	0.86	21.25	1.17	0.38	3.48
Std.Dev.=	0.12	1.12	3.69	0.16	19.68	0.72	2.89	1.73	0.21	0.81

DISTURBED SPOILS Total Group Comparisons

B.	pH	EC	SAT.%	SAR	C.F.%	OM%	Carb.	P	K	Alka.
TOTAL										
n=	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00
Mean=	7.79	2.77	28.95	1.62	46.80	1.90	26.67	0.99	0.59	2.23
Std.Dev.=	0.98	1.35	5.22	1.65	14.53	1.81	8.10	1.13	0.34	0.93

GROUP COMPARISON TESTS (t-tests)

C.										
t=	0.23	-5.41	0.76	-3.05	-1.10	-2.62	-3.06	0.56	-2.72	5.62
Deg.F.=	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
Sig.Lev.=	N.S.	**	N.S.	**	N.S.	**	**	N.S.	**	**

t= t value; Deg.F.= Degrees of Freedom; Sig.Lev.= Significance Level (** indicates less than .05)

APPENDIX

- SOILS LABORATORY RESULTS -

(RAW DATA)

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: August 20, 1991

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
12649	91REP-1	0-2	7.6	0.63	27.7	4.61	1.10	1.11	0.66	18.3	60.0	34.7	5.3	SANDY LOAM
12650		2-9	7.9	0.65	28.0	4.53	1.57	0.94	0.54	40.2	61.8	31.1	7.1	SANDY LOAM
12651		9-14	8.1	0.52	24.1	3.17	1.19	0.74	0.50	2.6	77.3	19.2	3.5	LOAMY SAND
12652		14-23	8.0	0.97	22.9	5.40	2.89	1.05	0.52	52.7	65.5	27.4	7.1	SANDY LOAM
12653	91SEDB-1	0-6	7.8	1.63	25.3	10.3	6.86	2.14	0.73	33.6	66.4	27.4	6.2	SANDY LOAM
12654		6-12	7.9	5.03	23.6	21.5	41.1	11.2	2.00	36.7	66.4	25.6	8.0	SANDY LOAM
12655		12-24	7.9	6.52	23.3	25.6	58.3	15.4	2.38	47.7	66.4	25.6	8.0	SANDY LOAM
12656	91SEDA-1	0-12	7.8	3.67	24.4	21.4	24.9	4.97	1.03	43.6	62.7	30.6	6.7	SANDY LOAM
12657		12-24	8.0	1.02	24.1	4.61	4.41	2.19	1.03	42.4	60.9	30.9	8.2	SANDY LOAM
12658	91SEDA-2	0-12	7.9	0.92	23.5	3.97	3.46	1.80	0.93	46.4	59.1	32.7	8.2	SANDY LOAM
12659		12-24	7.7	4.23	24.1	24.0	30.5	5.50	1.05	37.7	64.5	29.1	6.4	SANDY LOAM
12660	91SP-1	12-24	7.8	1.61	27.6	9.25	6.42	3.36	1.20	35.7	58.2	34.5	7.3	SANDY LOAM
12661		24-72	7.8	1.51	26.2	8.71	5.38	3.17	1.19	39.4	57.3	32.7	10.0	SANDY LOAM
12662	91SP-2	12-36	7.9	4.11	25.4	16.7	32.8	7.77	1.56	31.9	55.5	37.8	6.7	SANDY LOAM
12663		36-60	7.7	4.05	28.6	21.1	25.4	7.83	1.62	25.1	56.4	37.8	5.8	SANDY LOAM
12664	91TSP-1	0-6	7.9	0.50	30.0	3.25	1.00	0.76	0.52	52.8	60.9	32.4	6.7	SANDY LOAM
12665		6-16	8.0	0.52	29.2	3.15	1.62	0.74	0.48	36.1	59.1	35.1	5.8	SANDY LOAM
12666	91TSP-2	0-4	7.8	0.54	32.0	3.83	0.88	0.55	0.36	18.8	70.0	28.7	1.3	SANDY LOAM
12667		4-24	8.0	0.55	32.3	3.52	1.06	0.78	0.52	22.6	64.5	31.5	4.0	SANDY LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: August 20, 1991

Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
12649	91REP-1	0-2	0.4	23.8	8.39	0.64	5.40	1.70	0.1	0.11	11.6	5.3
12650		2-9	<0.1	28.5	1.82	0.63	5.13	1.50	0.1	0.06	10.2	5.0
12651		9-14	<0.1	23.5	1.00	0.48	3.67	1.40	<0.1	0.04	5.6	2.9
12652		14-23	<0.1	24.5	1.42	0.81	3.91	1.50	<0.1	0.04	9.3	4.4
12653	91SEDB-1	0-6	1.6	23.9	2.22	1.14	4.10	1.60	0.1	0.10	9.3	4.7
12654		6-12	0.8	24.2	0.95	0.82	2.56	1.90	<0.1	0.05	8.8	5.1
12655		12-24	2.0	23.9	1.14	0.87	2.42	1.90	<0.1	0.07	9.0	5.0
12656	91SEDA-1	0-12	2.9	24.4	0.77	0.53	2.26	1.40	<0.1	0.10	9.0	4.9
12657		12-24	0.3	24.5	0.93	0.27	3.41	2.00	0.1	0.05	9.7	4.8
12658	91SEDA-2	0-12	2.7	24.1	0.88	0.53	3.72	1.60	<0.1	0.08	9.3	4.8
12659		12-24	3.7	23.7	0.91	0.56	2.50	1.80	<0.1	0.11	8.9	4.9
12660	91SP-1	12-24	0.1	21.6	1.38	0.43	2.59	1.80	0.1	0.05	13.1	6.0
12661		24-72	0.7	21.0	1.59	0.43	2.60	1.80	0.1	0.05	12.4	6.9
12662	91SP-2	12-36	0.3	20.7	1.24	0.45	2.25	1.50	0.1	0.04	11.4	6.3
12663		36-60	0.4	18.7	3.95	0.78	2.58	1.70	0.1	0.07	12.3	6.6
12664	91TSP-1	0-6	1.1	21.1	1.73	0.35	3.50	1.60	0.1	0.08	12.0	7.7
12665		6-16	0.2	23.8	1.03	0.32	4.08	1.70	0.1	0.06	11.8	6.8
12666	91TSP-2	0-4	0.8	15.2	2.47	0.61	4.66	1.80	0.1	0.09	8.5	5.1
12667		4-24	0.3	19.9	1.19	0.36	3.70	1.50	0.1	0.05	10.0	5.8

* Air dry bulk density was substituted for 1/3 bar bulk density in calculations.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
12658	91SEDA-2	0-12	7.9	0.92	23.5	3.97	3.46	1.80	0.93	46.4	59.1	32.7	8.2	SANDY LOAM
12669	12658(DUP)	0-12	7.9	0.82	25.8	3.22	2.90	1.78	1.02		59.1	32.4	8.5	SANDY LOAM
12667		4-24	8.0	0.55	32.3	3.52	1.06	0.78	0.52	22.6	64.5	31.5	4.0	SANDY LOAM
12670	12667(DUP)	4-24	8.0	0.53	33.0	3.34	1.01	0.72	0.49		64.5	30.6	4.9	SANDY LOAM

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HUNTINGTON, UTAH
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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
12658	91SEDA-2	0-12	2.7	24.1	0.88	0.53	3.72	1.60	<0.1	0.08	9.3	4.8
12669	12658(DUP)	0-12	2.8	24.3	0.77	0.56	3.32					
12667		4-24	0.3	19.9	1.19	0.36	3.70	1.50	0.1	0.05	10.0	5.8
12670	12667(DUP)	4-24	0.8	19.8	1.28	0.37	3.68					

* Air dry bulk density was substituted for 1/3 bar bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble,ABDTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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DATE REPORTED: September 11, 1991

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13257	91-SED-B-2	0-24	7.6	2.68	40.2	21.7	9.31	3.36	0.85	45.5	62.4	27.6	10.0	SANDY LOAM
13258		24-48	7.8	6.24	27.2	28.4	49.8	7.63	1.22	20.5	59.6	26.4	14.0	SANDY LOAM

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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13257	91-SED-8-2	0-24	7.6	23.7	4.05	1.87	6.07	**	**	0.16	8.5	7.6
13258		24-48	1.4	29.0	0.78	0.62	2.00	1.90	<0.1	0.06	7.4	5.8

* Air dry bulk density was substituted for 1/3 bar bulk density in calculations.
** No clods present in sample to do a bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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DATE REPORTED: November 14, 1991

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
14572	91-SHP-1	0.0-0.5	7.5	5.64	22.9	18.8	20.4	35.5	8.02	61.4	71.5	19.8	8.7	SANDY LOAM
14573		0.5-2.0	7.5	2.97	28.9	17.5	12.8	5.76	1.48	38.2	64.2	26.2	9.6	SANDY LOAM
14574		2.0-5.0	7.6	2.36	28.3	13.0	10.1	4.87	1.43	45.3	62.4	28.0	9.6	SANDY LOAM
14575	91-SHP-2	0.0-0.5	7.8	4.68	27.6	10.6	12.3	27.0	7.98	53.1	62.7	26.8	10.5	SANDY LOAM
14576		0.5-1.0	7.7	3.58	29.2	11.9	11.0	16.1	4.76	32.4	55.5	30.3	14.2	SANDY LOAM
14577		1.0-3.0	8.0	1.22	29.6	3.98	6.53	3.11	1.36	18.3	50.9	34.9	14.2	LOAM
14578		3.0-5.0	7.9	2.65	26.6	8.28	21.8	6.52	1.68	30.8	57.3	28.5	14.2	SANDY LOAM

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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar	/3 bar	15 bar
14572	91-SHP-1	0.0-0.5	2.1	23.8	0.19	0.51	2.11	2.1	<0.1	0.06	9.0	4.4	9.0	4.4
14573		0.5-2.0	1.6	21.0	0.32	0.85	2.01	1.9	0.1	0.07	11.0	5.5	11.0	5.5
14574		2.0-5.0	1.4	21.4	0.30	0.81	2.23	1.7	0.1	0.05	11.2	5.6	11.2	5.6
14575	91-SHP-2	0.0-0.5	2.8	21.9	0.17	0.38	1.83	1.9	0.1	0.11	11.5	6.1	11.5	6.1
14576		0.5-1.0	1.5	23.2	0.17	0.35	1.76	2.0	0.1	0.06	12.9	6.8	12.9	6.8
14577		1.0-3.0	0.7	23.4	0.10	0.27	2.49	1.7	0.1	0.04	13.9	5.9	13.9	5.9
14578		3.0-5.0	0.9	27.9	0.08	0.68	1.73	1.8	0.1	0.03	12.2	14.0	12.2	14.0

* Air dry bulk density was substituted for 1/3 bar bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
14574		2.0-5.0	7.6	2.36	28.3	13.0	10.1	4.87	1.43	45.3	62.4	28.0	9.6	SANDY LOAM
14580	14574(DUP)	2.0-5.0	7.6	2.31	28.4	12.6	9.95	4.27	1.27		62.4	28.0	9.6	SANDY LOAM

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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
14574		2.0-5.0	1.4	21.4	0.30	0.81	2.23	1.7	0.1	0.05	11.2	5.6
14580	14574(DUP)	2.0-5.0	1.2	21.5	0.21	0.79	1.99			0.05	11.4	5.6

* Air dry bulk density was substituted for 1/3 bar bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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CO-OP MINING COMPANY
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DATE REPORTED: September 30, 1991

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13347	91USP-1	0.0-0.5	7.8	4.60	33.6	31.5	23.1	13.0	2.49	48.2	50.0	36.9	13.1	LOAM
13348		0.5-1.0	7.9	2.43	30.3	12.8	16.7	4.09	1.06	36.1	48.2	33.3	18.5	LOAM
13349		1.0-2.0	8.1	1.36	27.4	3.86	6.94	3.55	1.53	78.1	53.6	33.3	13.1	SANDY LOAM
13350		2.0-3.0	8.0	1.47	27.5	4.51	8.36	3.33	1.31	50.9	53.6	32.4	14.0	SANDY LOAM
13351		3.0-4.0	7.9	2.89	29.1	16.6	21.1	4.21	0.97	46.8	51.8	35.1	13.1	LOAM
13352		4.0-5.0	7.9	2.73	28.9	14.4	19.9	3.73	0.90	52.7	55.5	31.4	13.1	SANDY LOAM
13353		5.0-6.0	8.1	1.86	29.8	7.31	11.8	2.74	0.89	57.3	54.5	34.2	11.3	SANDY LOAM
13354		6.0-7.0	8.0	1.99	29.2	7.82	13.8	3.22	0.98	67.1	57.3	31.4	11.3	SANDY LOAM
13355		7.0-8.0	8.0	2.38	28.8	11.5	17.0	3.23	0.86	63.3	59.1	29.6	11.3	SANDY LOAM
13355A		8.0-9.0	8.0	2.10	30.3	7.91	14.4	3.11	0.93	59.4	56.4	31.4	12.2	SANDY LOAM
13356		9.0-10.0	8.1	2.08	28.6	8.76	14.6	3.48	1.02	62.9	57.3	31.4	11.3	SANDY LOAM
13357	91LH	0.0-0.5	7.6	2.60	31.7	13.6	7.21	13.2	4.09	47.9	66.4	24.1	9.5	SANDY LOAM
13358		0.5-1.0	8.1	3.11	34.3	6.57	15.1	16.1	4.89	52.1	35.5	46.0	18.5	LOAM
13359		1.0-1.5	8.2	2.39	36.3	4.44	13.1	11.9	4.02	44.1	49.1	34.2	16.7	LOAM
13360		1.5-2.6	8.2	2.91	33.8	4.14	13.7	14.8	4.96	33.3	50.0	34.2	15.8	LOAM
13361		4.0-6.0	8.2	3.90	35.1	6.20	23.8	18.9	4.88	47.9	41.8	38.7	19.5	LOAM
13362		6.0-8.0	8.2	2.04	31.7	4.16	10.8	8.73	3.19	42.0	54.5	30.6	14.9	SANDY LOAM
13363		8.0-0.0	8.2	2.09	26.3	4.42	10.3	8.61	3.17	35.3	60.9	26.9	12.2	SANDY LOAM
13364	91CSP-1	0.0-0.5	7.9	1.64	28.7	7.05	9.75	3.09	1.07	53.5	54.5	32.4	13.1	SANDY LOAM
13365		0.5-1.0	7.9	4.18	29.5	25.5	36.9	5.05	0.90	55.0	55.5	31.4	13.1	SANDY LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

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DATE REPORTED: September 30, 1991

Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13347	91USP-1	0.0-0.5	1.6	34.3	1.11	1.23	1.40	2.1	0.1	0.06	11.8	5.8
13348		0.5-1.0	0.8	31.8	0.86	1.05	1.43	2.1	0.1	0.04	12.3	5.8
13349		1.0-2.0	0.5	30.1	0.92	0.95	2.08	2.0	<0.1	0.04	11.1	5.5
13350		2.0-3.0	0.6	29.4	0.78	1.15	1.87	1.9	0.1	0.03	11.3	5.5
13351		3.0-4.0	0.9	31.3	1.23	1.41	1.52	2.0	0.1	0.04	11.7	6.2
13352		4.0-5.0	1.5	43.7	1.01	1.05	1.64	1.8	0.1	0.04	11.8	6.0
13353		5.0-6.0	0.8	37.1	0.97	0.81	1.68	1.9	0.1	0.04	11.7	6.1
13354		6.0-7.0	1.0	37.6	1.30	0.83	1.90	1.8	<0.1	0.04	12.1	6.1
13355		7.0-8.0	0.3	35.6	1.01	0.94	1.64	1.9	<0.1	0.04	11.3	5.6
13355A		8.0-9.0	0.3	34.7	0.67	0.74	2.11	2.1	0.1	0.04	12.2	5.5
13356		9.0-10.0	0.3	35.5	0.86	0.75	1.92	1.9	0.1	0.04	11.8	5.2
13357	91LH	0.0-0.5	5.5	45.0	7.00	0.46	6.08	1.9	<0.1	0.27	8.1	5.2
13358		0.5-1.0	0.8	46.5	5.12	0.29	1.98	2.1	0.1	0.05	12.8	8.3
13359		1.0-1.5	0.8	28.9	0.61	0.20	2.52	2.0	0.1	0.02	11.6	7.2
13360		1.5-2.6	0.5	28.4	0.59	0.15	2.57	2.0	0.1	0.03	10.9	7.3
13361		4.0-6.0	0.3	29.4	0.76	0.26	2.00	2.1	<0.1	0.02	11.5	7.7
13362		6.0-8.0	0.7	28.2	0.59	0.27	2.36	2.0	0.1	0.03	10.9	7.0
13363		8.0-0.0	0.8	18.3	0.72	0.28	2.43	1.9	<0.1	0.01	9.1	6.1
13364	91CSP-1	0.0-0.5	3.8	30.7	0.60	0.39	1.94	**	**	0.02	13.2	7.8
13365		0.5-1.0	4.1	29.5	0.56	0.45	1.78	2.0	<0.1	0.03	11.6	7.7

* Air dry bulk density was substituted for 1/3 bar bulk density.
** No clods present in samples to do a bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

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CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: September 30, 1991

Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13366	91CSP-1	1.0-4.0	7.9	5.04	29.8	27.9	50.8	7.25	1.16	62.2	55.5	32.3	12.2	SANDY LOAM
13367		4.0-8.0	7.9	3.20	31.1	22.6	23.2	2.43	0.51	53.3	55.5	32.3	12.2	SANDY LOAM
13368	91CSP-3	0.0-0.5	8.0	1.34	33.1	7.40	7.87	0.91	0.33	53.3	48.2	40.5	11.3	LOAM
13369		0.5-1.0	8.1	1.21	31.0	7.22	6.55	1.13	0.43	59.4	50.0	38.7	11.3	LOAM
13370		1.0-2.0	8.1	1.15	28.6	4.85	6.72	1.46	0.61	60.3	50.9	36.0	13.1	LOAM
13371		2.0-3.0	8.1	2.57	28.7	10.1	20.5	1.67	0.43	70.1	48.2	39.6	12.2	LOAM
13372		3.0-6.0	7.8	3.51	29.0	28.0	23.4	1.79	0.35	64.3	52.7	36.9	10.4	SANDY LOAM
13373		6.0-0.0	7.8	3.42	28.7	27.1	22.0	1.86	0.38	62.5	53.6	36.0	10.4	SANDY LOAM
13374	91CSP-4	0.0-0.5	7.8	3.71	32.3	27.1	26.3	2.80	0.54	45.2	55.5	33.2	11.3	SANDY LOAM
13375		0.5-1.0	7.8	3.86	30.5	27.6	26.7	2.93	0.56	49.1	59.1	32.4	8.5	SANDY LOAM
13376		1.0-2.0	7.9	3.79	31.5	26.0	27.3	4.61	0.89	63.6	58.4	30.3	11.3	SANDY LOAM
13377		2.0-3.0	7.8	3.81	32.0	26.2	25.7	2.70	0.53	60.2	58.4	30.3	11.3	SANDY LOAM
13378		3.0-4.0	7.7	3.44	30.7	28.8	19.0	2.18	0.45	54.3	56.5	32.2	11.3	SANDY LOAM
13379		4.0-5.0	7.7	3.51	31.7	30.2	22.0	2.59	0.51	55.7	58.4	31.2	10.4	SANDY LOAM
13380	91CSP-5	0.0-0.5	8.1	1.32	29.1	6.67	5.34	1.59	0.65	60.2	50.0	38.7	11.3	LOAM
13381		0.5-1.0	8.1	1.43	29.4	7.17	7.20	1.78	0.66	33.3	52.9	36.7	10.4	SANDY LOAM
13382		1.0-1.5	8.0	1.84	36.1	10.2	10.2	1.92	0.60	58.6	47.5	38.5	14.0	LOAM
13383		1.5-2.0	8.0	1.81	26.3	8.80	9.67	2.67	0.88	38.0	56.9	33.6	9.5	SANDY LOAM
13384		2.0-3.0	8.0	2.53	25.6	15.9	14.1	3.69	0.95	63.0	58.2	32.3	9.5	SANDY LOAM
13385		3.0-6.0	8.0	3.70	27.2	26.5	26.0	3.14	0.61	46.0	52.7	36.0	11.3	SANDY LOAM

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CO-OP MINING COMPANY
HUNTINGTON, UTAH
MINE: BEAR CANYON

DATE REPORTED: September 30, 1991

Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13366	91CSP-1	1.0-4.0	4.2	30.1	0.69	0.50	1.85	**	**	0.13	11.6	7.9
13367		4.0-8.0	4.6	30.9	0.67	0.54	1.66	1.9	<0.1	0.17	12.2	8.3
13368	91CSP-3	0.0-0.5	2.3	34.6	0.76	0.33	3.14	1.9	0.1	0.07	14.1	8.5
13369		0.5-1.0	1.8	33.0	0.52	0.26	2.30	2.0	<0.1	0.05	13.0	7.7
13370		1.0-2.0	0.5	34.4	0.46	0.28	2.39	2.1	<0.1	0.04	11.8	7.3
13371		2.0-3.0	0.5	37.9	0.55	0.74	2.13	2.2	<0.1	0.04	11.8	6.3
13372		3.0-6.0	1.0	34.0	0.59	0.75	1.66	**	**	0.05	10.8	5.7
13373		6.0-0.0	1.5	10.8	0.70	0.62	1.52	1.9	<0.1	0.07	11.1	5.5
13374	91CSP-4	0.0-0.5	5.8	25.0	0.50	0.56	1.61	1.6	<0.1	0.28	11.0	5.8
13375		0.5-1.0	5.8	23.1	0.55	0.61	1.59	**	**	0.28	10.8	5.8
13376		1.0-2.0	5.5	21.6	0.53	0.62	1.71	1.5	<0.1	0.28	11.0	5.9
13377		2.0-3.0	5.5	22.8	0.52	0.60	1.66	**	**	0.29	10.7	5.9
13378		3.0-4.0	5.5	22.8	0.65	0.61	1.90	**	**	0.26	10.7	5.4
13379		4.0-5.0	5.6	21.7	0.75	0.55	1.85	1.3	<0.1	0.32	10.5	6.1
13380	91CSP-5	0.0-0.5	1.4	23.7	0.58	0.16	1.61	2.0	<0.1	0.07	10.0	5.7
13381		0.5-1.0	1.0	18.8	0.48	0.18	2.08	2.0	0.1	0.06	10.2	4.1
13382		1.0-1.5	2.9	23.3	0.54	0.21	1.66	1.9	<0.1	0.11	7.2	6.9
13383		1.5-2.0	0.7	23.9	0.36	0.20	1.59	1.9	0.1	0.05	9.7	5.1
13384		2.0-3.0	0.5	24.5	0.32	0.18	1.45	1.9	<0.1	0.03	10.6	4.9
13385		3.0-6.0	0.5	21.9	0.65	0.16	1.19	1.8	0.1	0.04	11.4	5.4

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HUNTINGTON, UTAH
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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13386	91PAR-1	0.0-0.5	8.0	1.18	25.2	5.31	2.28	4.40	2.26	44.8	66.4	25.1	8.5	SANDY LOAM
13387		0.5-1.0	8.1	1.07	25.2	3.61	1.51	4.60	2.87	52.5	66.4	26.0	7.6	SANDY LOAM
13388		1.0-2.0	7.8	1.86	30.1	12.3	4.81	2.31	0.79	47.8	62.4	29.1	8.5	SANDY LOAM
13389		2.0-5.0	7.8	1.63	30.6	11.0	4.66	0.78	0.28	40.0	56.9	30.9	12.2	SANDY LOAM
13390		5.0-7.0	8.2	3.51	44.2	7.46	26.4	4.69	1.14	38.5	43.3	42.7	14.0	LOAM

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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13386	91PAR-1	0.0-0.5	1.0	20.6	1.09	0.59	2.84	**	**	0.08	10.1	4.2
13387		0.5-1.0	1.8	24.1	1.26	0.58	2.90	1.7	<0.1	0.08	7.7	4.7
13388		1.0-2.0	1.3	29.0	0.95	0.93	2.34	1.8	0.1	0.08	11.7	5.2
13389		2.0-5.0	1.0	31.6	0.73	0.69	2.47	1.7	0.1	0.07	13.2	5.6
13390		5.0-7.0	2.0	31.1	0.85	0.73	3.73	1.7	0.1	0.12	19.5	9.3

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13349		1.0-2.0	8.1	1.36	27.4	3.86	6.94	3.55	1.53	78.1	53.6	33.3	13.1	SANDY LOAM
13392	13349(DUP)	1.0-2.0	8.2	1.47	27.4	3.99	6.93	3.41	1.46		52.7	34.2	13.1	SANDY LOAM
13376		1.0-2.0	7.9	3.79	31.5	26.0	27.3	4.61	0.89	63.6	58.4	30.3	11.3	SANDY LOAM
13393	13376(DUP)	1.0-2.0	7.9	3.97	31.8	26.2	27.1	4.18	0.81		52.7	36.0	11.3	SANDY LOAM
13380	91CSP-5	0.0-0.5	8.1	1.32	29.1	6.67	5.34	1.59	0.65	60.2	50.0	38.7	11.3	LOAM
13394	13380(DUP)	0.0-0.5	8.1	1.23	28.8	6.45	5.53	1.25	0.51		52.9	35.8	11.3	SANDY LOAM
13390		5.0-7.0	8.2	3.51	44.2	7.46	26.4	4.69	1.14	38.5	43.3	42.7	14.0	LOAM
13395	13390(DUP)	5.0-7.0	8.2	3.34	47.2	7.72	28.0	4.67	1.11		40.2	46.7	13.1	LOAM

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Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13349		1.0-2.0	0.5	30.1	0.92	0.95	2.08	2.0		0.04		
13392	13349(DUP)	1.0-2.0	0.2	30.0	0.42	1.08	2.13					
13376		1.0-2.0	5.5	21.6	0.53	0.62	1.71	1.5		0.28		
13393	13376(DUP)	1.0-2.0	5.2	22.2	0.44	0.61	1.66					
13380	91CSP-5	0.0-0.5	1.4	23.7	0.58	0.16	1.61	2.0		0.07		
13394	13380(DUP)	0.0-0.5	1.5	23.4	0.65	0.16	1.87					
13390		5.0-7.0	2.0	31.1	0.85	0.73	3.73	1.7		0.12		
13395	13390(DUP)	5.0-7.0	2.3	30.2	1.03	0.74	3.98					

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Lab No.	Location	Depths	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium meq/l	Magnesium meq/l	Sodium meq/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
13545	91LB-1	0.0-4.0	7.8	1.24	39.5	7.59	2.31	1.96	0.88	17.7	74.5	22.2	3.3	LOAMY SAND
13546		4.0-8.0	8.0	0.71	27.7	3.98	1.37	0.69	0.42	55.7	78.2	18.5	3.3	LOAMY SAND
13547		8.0-24.0	8.0	1.05	30.5	6.01	2.62	0.81	0.39	58.8	63.6	30.4	6.0	SANDY LOAM
13548		24.0-48.0	8.2	0.69	25.5	2.70	3.43	1.00	0.57	72.7	65.5	29.4	5.1	SANDY LOAM
13549		48.0-96.0	7.9	5.08	29.7	23.2	30.6	2.98	0.57	30.3	67.3	27.6	5.1	SANDY LOAM
13550	91LB-2	0.0-8.0	7.9	0.67	35.6	4.39	1.43	0.57	0.33	27.0	70.9	24.9	4.2	SANDY LOAM
13551		8.0-16.0	7.9	0.58	30.3	3.66	1.01	0.70	0.46	54.1	58.2	35.8	6.0	SANDY LOAM
13552		16.0-24.0	7.9	0.67	26.9	3.52	2.27	0.86	0.51	77.1	68.2	27.6	4.2	SANDY LOAM
13553		24.0-48.0	8.1	0.52	29.8	2.66	2.78	0.63	0.38	40.5	57.3	37.6	5.1	SANDY LOAM
13554		48.0-96.0	8.0	2.38	29.9	12.7	16.0	1.46	0.39	32.5	66.4	27.6	6.0	SANDY LOAM
13555	91LB-3	0.0-2.0	7.9	0.66	35.0	4.38	1.18	1.67	1.00	63.5	67.3	29.4	3.3	SANDY LOAM
13556		2.0-8.0	7.9	0.46	33.1	3.12	0.84	0.89	0.63	45.7	58.2	35.8	6.0	SANDY LOAM
13557		8.0-16.0	8.1	0.44	28.4	2.53	0.97	0.69	0.52	72.3	57.3	35.8	6.9	SANDY LOAM
13558		16.0-96.0	7.9	3.36	28.8	14.5	26.6	3.12	0.69	42.6	60.2	33.8	6.0	SANDY LOAM

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13545	91LB-1	0.0-4.0	2.4	19.2	2.37	0.73	4.22	1.6	<0.1	0.15	12.7	6.7
13546		4.0-8.0	0.5	18.6	0.25	0.52	2.76	**	**	0.05	9.0	4.5
13547		8.0-24.0	0.9	22.7	0.53	0.47	3.39	1.7	0.1	0.07	13.9	5.6
13548		24.0-48.0	0.5	23.2	0.25	0.14	3.25	1.8	<0.1	0.05	12.2	5.4
13549		48.0-96.0	0.9	18.6	0.49	0.49	2.23	1.6	<0.1	0.05	11.5	4.7
13550	91LB-2	0.0-8.0	0.7	18.8	0.60	0.16	3.58	1.7	<0.1	0.12	13.7	6.3
13551		8.0-16.0	0.6	18.3	0.18	0.13	3.28	1.4	<0.1	0.06	13.3	5.3
13552		16.0-24.0	0.7	23.3	0.27	0.15	4.42	**	**	0.05	13.7	5.4
13553		24.0-48.0	2.2	22.5	0.11	0.09	3.77	1.5	0.1	0.05	12.5	4.7
13554		48.0-96.0	0.6	18.7	0.16	0.22	2.34	1.6	0.1	0.05	11.8	4.8
13555	91LB-3	0.0-2.0	2.8	19.1	0.76	0.29	3.85	**	**	0.11	12.7	5.4
13556		2.0-8.0	1.4	19.0	0.34	0.16	3.25	1.5	0.1	0.09	13.2	5.2
13557		8.0-16.0	0.8	22.7	0.23	0.17	3.44	1.5	<0.1	0.05	14.3	5.7
13558		16.0-96.0	0.8	22.6	0.05	0.40	2.34	1.4	0.1	0.06	12.4	4.9

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13552		16.0-24.0	7.9	0.67	26.9	3.52	2.27	0.86	0.51	77.1	68.2	27.6	4.2	SANDY LOAM
13560	13552(DUP)	16.0-24.0	7.9	0.78	28.0	4.47	3.08	0.91	0.47		67.5	27.4	5.1	SANDY LOAM

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DATE REPORTED: September 30, 1991

Lab No.	Location	Depths	Organic Matter %	Carbonate %	P ppm	K PE meq/l	Alkalinity PE meq/l	Bulk Density *	Water Retention Difference in/in*	Total Kjeldahl Nitrogen %	1/3 bar	15 bar
13552		16.0-24.0	0.7	23.3	0.27	0.15	4.42			0.05		
13560	13552(DUP)	16.0-24.0	0.7	23.5	0.16	0.19	5.15					

* Air dry bulk density was substituted for 1/3 bar bulk density.
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, ABPTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

Appendix 2-E

SCS SOIL SURVEY

SOIL SURVEY AND INTERPRETATIONS
VEGETATION SURVEY
for
CO-OP MINING CO.
Huntington Canyon
March 1980

Earl Jensen, Soil Scientist, SCS
George Cook, Range Conservationist, SCS
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SOIL SURVEY AND INTERPRETATIONS
VEGETATION SURVEY
for
CO-OP MINING CO.

At the request of Wendell Owen, representing CO-OP Mining Co., and the San Rafael Soil Conservation District, the Soil Conservation Service performed a soil and vegetation survey on proposed mine property in Huntington Canyon. The surveys were designed to comply with the March 1979 Permanent Regulatory Program Requirements of the office of Surface Mining Reclamation and Enforcement, Department of Interior.

The survey covers approximately 23 acres on Bear Creek in Huntington Canyon, Emery County, Section 25, T16S, R7E, SLBM. The soils are shown on the attached map. Each soil is identified with a three letter symbol, and the pattern and extent are shown by the soil boundary lines on the map. It should be noted that the entire survey area had been disturbed from previous mining activities. Therefore, the soil characteristics were projected from the surrounding areas. All areas having the same symbol are essentially the same kind of soils. There may be small areas of other soils included within the delineation that are slightly different. The soils are named but have not been correlated. When the overall county survey is completed, small areas may become inclusions in other map units. Some names may change also. Included at the end of the report are the engineering uses and interpretations of the soils. The soil horizonation symbols, procedures, and nomenclature are as defined in the Soil Survey Manual (Ag. Handbook No. 18), National Soil Handbook of the Soil Conservation Service, and Soil Taxonomy.

SCS range conservationist, George Cook, visited each described soil in the survey area in November and recorded present vegetation and productivity according to ecological site analysis methods of the Soil Conservation Service. Present vegetation was recorded by percentage air dry weight. Estimates were made of annual production and range condition for the 1980 growing season. These findings are included in this report and the ecological sites identified on the soil map accompanying the soil report.

Most of the soils in the survey area are used as rangeland and wildlife habitat except where mine disturbances have occurred. On areas that have similar climate and topography, the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between soils and vegetation and water.

In this survey area the soils are grouped into ecological sites. An ecological site is an area or areas of rangeland or woodland uniform enough in climate, soils, drainage, exposures and topography that it supports a definite plant community that will produce a specific amount of vegetation. The kind of vegetation is generally the combination of plants that grew on the site before the range or woodland was affected by grazing, cultivation or otherwise altered and is called the potential vegetation. Normally the potential vegetation is the most productive combination of range or woodland plants that a site can support. Potential plant communities for the Bear Creek Canyon area obtained from clipping data, is not yet available from the Bureau of Land Management. As climate is a major factor in determining the potential plant community different climatic regime have been defined to facilitate the grouping of soils into ecological sites and the naming of sites. In this survey area there are two climatic regimes used. These are defined generally as follows:

Upland Climatic Regime - The average annual precipitation is 12 to 16 inches. Approximately 35 to 40 percent comes during the summer months. The growing period usually begins about April 1 and lasts until the first of November until moisture is depleted or the plants mature. The freeze-free season is 100 to 130 days, and the mean annual temperature is 47° to 50° F.

Mountain Climatic Regime - The average annual precipitation is 16 to 20 inches. Approximately 35 percent comes during the summer months. The growing season begins in the later part of April and lasts until the middle of October or until moisture is depleted or the plants mature. The freeze-free season is 80 to 110 days and the mean annual temperature is 44° to 47° F.

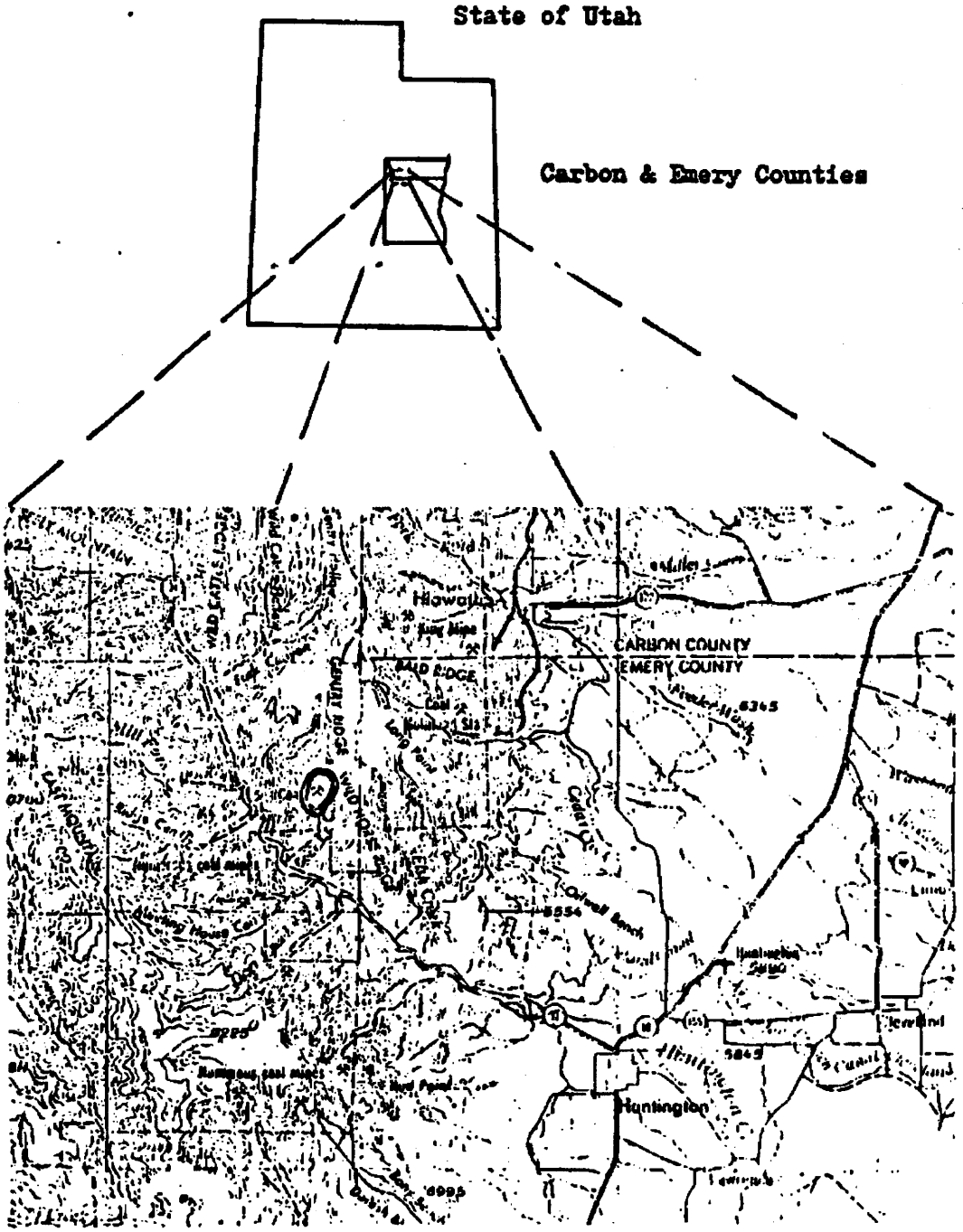
Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the exisitng community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site.

Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

More detailed information is available in the Price Field Office of the Soil Conservation Service.

LOCATION MAP
FOR
Soil Survey
of
CO-OP Mining Co.
Bear Canyon Area



Survey Area Circled

SOIL LEGEND

Soil Symbol	Soil Mapping Unit Name
D2E	Datino bouldery fine sandy loam, 5 to 20 percent slopes
D1G	Datino very stony fine sandy loam, 55 to 70 percent slopes

DESCRIPTION OF THE SOILS

D2E Datino bouldery fine sandy loam, 5 to 20 percent slopes.

This Datino soil is very deep and well drained. It occurs on moderately steep alluvial fans and some sloping flood plains at elevations of 7,100 to 7,140 feet (2,165 to 2,177 meters). This soil formed in alluvium and colluvium derived mainly from sandstone and shale. The average annual precipitation is 14 to 16 inches (36 to 41 centimeters). Mean annual air temperature is 42 to 45 degrees F. (5 to 7 degrees C.), mean annual soil temperature is 44 to 47 degrees F. (6 to 8 degrees C.), and the average freeze-free season is about 80 to 110 days.

Slopes are 5 to 20 percent and mostly east facing. They are short and concave-convex.

Vegetation is dominantly pinyon, Utah juniper, salina wildrye, squirreltail, big sagebrush, Douglas-fir, and Rocky Mountain juniper.

Included in mapping are small areas of a similar soil except with 20 percent gravel and cobbles in the surface layer.

In a typical profile the surface layer is brown, bouldery fine sandy loam and cobbly loam about 10 inches (25 centimeters) thick. The subsoil is light brown very stony loam about 28 inches (71 centimeters) thick. The substratum is light reddish brown cobbly fine sandy loam to a depth of 60 inches (1.5 meters) or more.

Permeability is moderate. Available water capacity is 6 inches (15 centimeters) to a depth of 60 inches (1.5 meters). Organic matter content in the surface layer is 4 percent. Effective rooting depth is about 60 inches (1.5 meters). Surface runoff is medium and erosion hazard is moderate under potential native vegetation and high if vegetation is removed and the soil is left bare. Erodibility is low. This soil is used for range, wildlife habitat, and mining operations.

Taxonomic classification is loamy-skeletal, mixed Typic Haploboralls.

A typical pedon of Datino bouldery fine sandy loam, 5 to 20 percent was described on the cut about 200 feet east and 1100 feet south of the NW corner of Section 25, T16S, R7E.

A11 -- 0 to 2 inches (0 to 5 centimeters) brown (10YR 5/3) bouldery fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; loose, very friable, slightly sticky, nonplastic; common very fine to medium, few coarse roots; 10 percent boulders, 10 percent stones, 5 percent cobbles, 10 percent gravel; slightly calcareous; moderately alkaline (8.0); abrupt smooth boundary.

A12 -- 2 to 10 inches (5 to 25 centimeters); brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) when moist; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; common very fine to medium, few coarse roots; 10 percent cobble and 10 percent gravel; moderately calcareous; moderately alkaline (ph 8.2); clear smooth boundary.

B2 -- 10 to 38 inches (25 to 96 centimeters); light brown 7.5YR 6/4) very stony loam, brown (7.5YR 4/4) when moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine to medium roots; 1 percent boulders, 30 percent stone, 10 percent cobbles, 20 percent gravel; moderately calcareous; strongly alkaline (ph 8.5); abrupt wavy boundary.

C1 -- 38 to 60 inches (96 to 152 centimeters) light reddish brown (5YR 6/4) cobbly fine sandy loam, reddish brown (5YR 4/4) when moist; massive; soft, very friable, slightly sticky, nonplastic; few very fine and fine roots; 10 percent cobbles, 5 percent gravel; strongly calcareous; strongly alkaline (ph 8.6).

DIG Datino - Rock outcrop complex, 55 to 70 percent slopes.

This map unit is on very steep canyon sideslopes. Slopes are short and concave-convex, Elevation is 7,140 to 7,600 feet (2,177 to 2,318 meters). The average annual precipitation is 14 to 16 inches (36 to 41 centimeters). Mean annual air temperature is 42 to 44 degrees F. (6 to 7 degrees C.) and the average frost-freeze season is 80 to 110 degrees.

This unit is 75 percent Datino very stony fine sandy loam, 55 to 70 percent slopes in single and concave areas and 15 percent rock outcrop on ridges.

Included in this unit is about 10 percent of a shallow soil that is about 6 to 15 inches in depth, associated with the Rock outcrop.

The Datino soil is very deep and well drained. This soil formed in colluvium derived mainly from sandstone and shale. Slopes are 55 to 70 percent and east facing. They are short and concave-convex. Vegetation is dominantly pinyon, Utah juniper, Rocky Mountain juniper, salina wildrye, Douglas-fir, curlleaf mountainmahogany.

In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 inches (41 centimeters) thick. The subsoil is very pale brown, very stony sandy clay loam about 20 inches (51 centimeters) thick. The substratum is very pale brown, very stony silty clay loam to a depth of more than 60 inches (152 centimeters).

Permeability is moderate to 36 inches (91 centimeters) and moderately slow below 36 inches. Available water capacity is 6.5 inches (16 centimeters) to a depth of 60 inches (1.5 meters). Organic matter content in the surface layer is about 4 percent. Effective rooting depth is about 60 inches (1.5 meters). Surface runoff is rapid and erosion hazard is high under potential native vegetation and very high if vegetation is removed and the soil is left bare. Erodibility is low. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haploboralls.

A typical pedon of Datino very stony fine sandy loam, 55 to 70 percent slopes was described on the bank about 150 feet north of the old mine portal about 300 feet north and 300 feet east of the SW corner of Section 24, T16S, R7E.

All -- 0 to 3 inches (0 to 8 centimeters); brown (10YR 5/3) very stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, few medium and course roots; moderately calcareous; moderately alkaline (ph 8.4); abrupt smooth boundary.

A12 -- 3 to 16 inches (8 to 41 centimeters); yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 percent boulders, 10 percent stones, 10 percent cobbles, 10 percent gravel; moderately calcareous; moderately alkaline (ph 8.4); clear smooth boundary.

B2 -- 16 to 36 inches (41 to 91 centimeters) very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic; common very fine and fine roots; many fine pores; 2 percent boulders, 15 percent stones, 15 percent cobbles, 10 percent gravel; moderately calcareous; strongly alkaline (ph 8.6); abrupt wavy boundary.

C1 -- 36 to 60 inches (91 to 152 centimeters) very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 percent boulders, 10 percent stones, 10 percent cobbles, 5 percent gravel; strongly calcareous; strongly alkaline (ph 8.9).

DESCRIPTION OF PRESENT VEGETATION

Upland Stony Loam (Pinyon-Juniper) Ecological Site

Two inventories of the Upland stony loam (P-J) ecological sites in the Bear Canyon area recorded the following vegetation as a percentage of air dry weight:

1) Pit 1, SW¼, Sec. 24, T16S, R7E. This site relates to the D1G soil.

2) Pit 2, NW¼, Sec. 25. T16S, R7E. This site relates to the D2E soil.

	Percent	
Grass and Grass-like Plants	Pit 1	Pit 2
Indian ricegrass	5	5
Salina wildrye	25	10
Squirreltail		10
Sedge		2
Needleandthread		2
Muttongrass	T	1
Forbs		
Buckwheat	1	
Mustard	1	2
Aster	1	2
Other	2	2
Crytantha		2
Stickseed		2
Trees and Shrubs		
Rubber rabbitbrush		5
White fir	5	
Douglas fir	5	5
Pinyon pine	30	25
Juniper	10	10
Rocky Mountain juniper	10	5
Curlleaf mountainmahogany	5	
Big sagebrush		5
Elderberry		5
Total annual Production (estimated in pounds/acre)	900	1500
Ecological rating	Good	Good

Notes: Inventories were completed in November, 1980, making forb identification very difficult. The vicinity of Pit 2 appeared to have been burned in early 1900's. These sites were in a transition zone between upland and mountain climates.

Nov. 1990

SOIL LEGEND

Soil Symbol	Soil Mapping Unit Name
DZE	Datino-Sheepcan-Winetti bouldery loams, 5 to 20 percent slopes
PDR	Podo-Latino-Rock outcrop complex, 40 to 70 percent slopes
TR	Travessilla - Rock out crop - Strych complex

DESCRIPTION OF THE SOILS

DZE - Datino - Sheepcan - Winetti bouldery loams, 5 to 20 percent slopes.

These soils are very deep and well drained. They occur in alluvial valleys and on some moderately sloping toe slopes at elevations of 7,000 to 7,340 feet. These soils formed in alluvium and colluvium derived mainly from sandstone, limestone and shale. The average annual precipitation is 14 to 16 inches. Mean annual soil temperature is 44 to 47 degrees F., and the average freeze-free season is about 80 to 110 days.

Slopes are 5 to 20 percent, and are short and concave to convex.

This map unit is about 55 percent Datino bouldery loam, about 20 percent Sheepcan bouldery loam, these soils are on toe slopes and on the more stable areas of the valley floor, and about 15 percent Winetti bouldery loam on the stream banks and near stream channels. Also included in this mapping unit are about 10 percent other soils and land areas including the Strych soil, rubbleland, some areas of bedrock, and areas of man made fill or disturbed areas.

Vegetation is dominantly pinyon, Utah juniper, salina wildrye, squirreltail, big sagebrush, Douglas-fir, and Rocky Mountain juniper.

Also included in mapping are small areas of similar soils except with 20 percent gravel and cobbles in the surface layer.

In a typical profile of Datino bouldery loam, the surface layer is brown, bouldery loam about 4 inches thick. The upper subsoil is light brown cobbly loam about 7 inches thick. The lower subsoil is pink very gravelly sandy loam

and very gravelly loam to 56 inches. The substratum is reddish yellow, and light yellowish brown gravelly loam and very gravelly sandy loam to a depth of 80 inches or more.

In a typical pedon of Sheepcan bouldery loam, the surface layer is grayish brown bouldery loam about 5 inches thick. The subsoil is pale browm loam about 11 inches thick. The substratum is light yellowish brown gravelly and very cobbly loam to 60 inches.

In a typical pedon of Winetti bouldery loam, the soil has a very thin surface layer about 1 inch thick or this soil may lack any topsoil. If present the surface layer typically is pale brown bouldery loam. The substratum is stratified bouldery sandy loam, loamy sand or loam to 60 inches.

Permeability of these soils is moderate. Available water capacity is 5 to 8 iunches to a depth of 60 inches. Organic matter content in the surface layer of the Datino and Sheepcans soils are about 3 to 4 percent. Effective rooting depth is about 60 inches. Surface runoff is medium and erosion hazard is moderate under potential native vegetation and high if vegetation is removed and the soil is left bare. The Winetti soils are subject to flooding during heavy rain or snowmelt events. These soils are used for range, wildlife habitat, and mining operations.

Taxonomic classification of Datino is loamy skelatal, mixed Typic Haplo borails.

A typical pedon of Datino bouldery loam, 5 to 20 percent slopes, described on a cut about 800 feet east and 1000 feet south of the northwest cornet of section 25 T16S.R7E.

A1 -- 0 to 5 inches; brown (10YR 5/3) bouldery loam, very dark grayish brown (10YR 3/2) when moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, common fine, medium and few coarse roots; 5 percent boulders, 10 percent cobbles and 20 percent gravel; mildly alkaline (pH 7.8); abrupt wavy boundary.

BW -- 5 to 11 incher; lightr brown (7.5YR 6/4) very cobbly sandy loam; brown (7.5YR 5/4) when moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 1 percent stones, 15 percent cobbles, 30 percent gravel; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

BK2 -- 34 to 56 inches; pink (7.5YR 7/4) very gravelly loam; reddish yellow (7.5YR 6/6) moist: massive: slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, few medium and coarse roots; 1 percent stones, 15 percent cobbles and 45 percent gravel; violently

calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

C! -- 56 to 64 inches; light yellowish brown (10YR 6/4) gravelly loam; brown (7.5 YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine and few medium roots; 2 percent cobbles, 20 percent gravel; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C2 -- 64 to 80 inches; reddish yellow (7.5YR 7/6) very gravelly sandy loam, strong brown (7.5YR 5/6) moist; single grained; loose, nonsticky, nonplastic; few very fine roots; 1 percent stones, 5 percent cobbles, 50 percent gravel; moderately calcareous; moderately alkaline (pH 8.4).

Taxonomic classification of Sheepcan is Fine-loamy, mixed (Calcareous), frigid Typic Ustorthents.

A typical pedon of Sheepcan bouldery loam, 5 to 20 percent slopes, described about 700 feet east 1100 feet south of the northwest corner of section 25 T16S.R7E.

A -- 0 to 5 inches; grayish brown (10YR 5/2) bouldery loam; very dark grayish brown (10YR 3/2) moist: moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, common medium and coarse roots; 5 percent boulders, 5 percent cobbles, 15 percent gravel; slightly calcareous; moderately alkaline (pH 8.0; abrupt smooth boundry.

BW -- 5 to 16 inches; pale brown (10YR 6/3) loam; dark yellowish brown (10YR 4/4) moist; weak medium subangular block, structure; slightly hard, friable, slightly sticky, plastic; common very fine, fine, medium and coarse roots; 2 percent cobbles, 10 percent gravel; slightly calcareous; moderately alkaline (pH 8.0) clear smooth boundary.

C1 -- 16 to 30 inches; light yellowish brown (10YR 6/4) gravelly loam; yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, few medium and coarse roots; 5 percent cobbles, 15 percent gravel; moderately calcareous; moderately alkaline (pH 8.2); slear wavy boundary.

C2 -- 30 to 60 inches; light yellowish brown (10YR 6/4) very cobbly loam; light olive brown (2.5Y 5/4) moist; slightly hard, friable, slightly sticky, slightly plastic; ommon very fine, few fine and medium roots; 2 percent stones, 15 percent cobbles, 20 percent gravel; moderately calcareous; moderately alkaline.

Taxonomic classification of Winetti is Loamy-skelatal, mixed (calcareous), frigid, Typic Ustifluvents.

No typical pedon of Winetti bouldery loam was fully described because this soil is so variable. In the profiles examined typically there may or may not be an A horizon underlain by recent alluvium which is stratified. In one profile examined in the stream bank about 500 feet south of the mine office.

A -- 0 to 1 inch; pale brown (10YR 6/3) bouldery loam; brown (10YR 4.3) moist; moderate thin platy structure; slightly hard; very friable; slightly sticky, slightly plastic; common very fine and fine roots; 8 percent boulders, 25 percent cobbles, 20 percent gravel; mildly alkaline (pH 7.8); abrupt smooth boundary.

C -- 1 to 60 inches; stratified multicolored recent alluvium rangeing in texture from cobbly or bouldery loamy sand to very gravelly sandy loam; single grained; loose, nonsticky, nonplastic; moderately calcareous, moderately alkaline (pH 8.2).

FDR Podo - Datino - Rock outcrop complex, 40 to 70 percent slopes.

This map unit is on very steep canyon sideslopes. Slopes are short and concave to convex, Elevation is 7,000 to 8,000 feet. The average annual precipitation is 14 to 16 inches. Mean annual air temperature is 42 to 44 degrees F. and the average frost-freeze season is 80 to 110 days.

This unit is 35 percent Podo very stony fine sandy loam on mountainside slopes, 35 percent Datino very stony fine sandy loam, 55 to 70 percent slopes on toe slopes and in concave areas and 20 percent rock outcrop on ridges.

Included in this unit are about 10 percent Strych, Travessillia and Sheepcan soils.

The Podo soil is shallow over sandstone and limestone bedrock, and it is well drained. The soil formed in residuum and colluvium from sandstone and limestone. Slopes are 50 to 70 percent and generally convex. Vegetation is dominantly pinyon pine, Utah juniper, bitter brush, curlleaf mountain mahogany, Douglas fir, salina wildrye, Indian ricegrass and Rocky Mountain juniper.

In a typical profile the surface layer is brown very stony fine sandy loam about 3 inches thick. The substratum is light yellowish brown stony sandy loam over sandstone bedrock at 12 inches.

Permeability is moderately rapid, available water capacity is very low, about .75 to 1 inch. Organic matter content in the surface is low. Surface runoff is rapid and erosion hazard is very high. This soil is used for range, wildlife habitat, and mining operations.

Taxonomic classification is loamy, mixed (calcareous), frigid, Lithic Ustorthents.

A typical pedon of Podo very stony fine sandy loam, 40 to 70 percent slopes described on a mountain slope 1000ft east and 1200ft south of the northwest corner of Section 25, T16S, R7E.

A1 -- 0 to 3 inches; brown (10YR 5/3) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; 10 percent stones, 10 percent cobbles, 20 percent gravel; many fine, few medium and coarse roots; slightly calcareous; mildly alkaline (pH 7.8); abrupt wavy boundary.

C -- 3 to 12 inches, light yellowish brown stoney sandy loam, brown (10YR 4/3) when moist; weak fine subangular blocky structure; slightly hard; very friable; slightly sticky, slightly plastic; 10 percent stones, 5 percent cobbles, 10 percent gravels; common fine, few medium and coarse roots; moderately calcareous; moderately alkaline (pH 8.0); abrupt irregular boundary.

The Datino soil is deep to very deep and well drained. This soil formed in colluvium derived mainly from sandstone and shale. Slopes are 40 to 60 percent and northeast to northwest facing. They are short and generally concave but may be convex on the toeslopes. Vegetation is dominantly pinyon pine, Utah juniper, Rocky Mountain juniper, salina wildrye, Douglas-fir, curlleaf mountain mahogany.

In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 inches thick. The subsoil is very pale brown, very stony silty clay loam to a depth of 36 inches and the substratum is very pale brown stony silty clay loam to more than 60 inches.

Permeability is moderate to 36 inches. Available water capacity is 6.5 inches to a depth of 60 inches. Organic matter content in the surface layer is about 4 percent. Effective rooting depth is about 60 inches. Surface runoff is rapid and erosion hazard is high under native vegetation and very high if vegetation is removed and the soil is left bare. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haploborolls.

A typical pedon of Datino very stony fine sandy loam, 40 to 70 percent slopes described on the bank about 150 feet north of the old mine portal about 300 feet north and 300 feet east of the SW corner of Section 24, T16S, R7E.

A1 -- 0 to 3 inches; brown (10YR 5/3) very stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, few medium and course roots; moderately calcareous; moderately alkaline (pH 8.4); abrupt smooth boundary.

A2 -- 3 to 16 inches; yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 percent boulders, 10 percent stones, 10 percent cobbles, 10 percent gravel; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B -- 16 to 36 inches very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic; common very fine and fine roots; many fine pores; 2 percent boulders, 15 percent stones, 15 percent cobbles, 10 percent gravel; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C -- 36 to 60 inches very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 percent boulders, 10 percent stones, 10 percent cobbles, 5 percent gravel; strongly calcareous; strongly alkaline (pH 8.9).

Rock outcrop is exposed sandstone and limestone.

TR - Travessilla - Rock outcrop - Strych complex, 50 to 70 percent slopes.

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 feet. They are generally on southeast to southwest facing aspects. The average annual precipitation is 12 to 14 inches. Mean annual air temperature is 45 to 47 degrees F. and the freeze period is 80 to 120 days.

This unit is about 35 percent Travessilla soil on ridges and side slopes, about 30 percent rock outcrop and about 15 percent Strych soils in the draws and concave positions. Included in this unit is about 10 percent rubbleland and about 10 percent other soils including Podo, Datino, Sheepscan and a soil similiar to Travessilla with loam or clay loam textures over weathered shale.

The Travessilla soil is shallow over sandstone bedrock and it is well drained. The soil formed in residuum and colluvium from sandstone and limestone. Slopes are 50 to 75 percent and generally convex. Vegetation is dominantly pinyon pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and few Douglas fir.

In a typical profile the surface layer is brown very bouldery fine sandy loam about 2 inches thick. The substratum is light brown gravelly fine sandy loam about 9 inches thick and pink very cobbley fine sandy loam overlying sandstone bedrock at 14 inches.

Permeability is rapid, available water capacity is very low, about .5 to 1 inch. Organic matter content in the surface is low. Surface runoff is rapid and erosion hazard is very high. These soils are used for range, wildlife habitat and mining operations.

Taxonomic classification is loamy, mixed, (calcareous), mesic, Lithic Ustic Torriorthents.

A typical pedon of Travessilla very bouldery fine sandy loam, 50 to 75 percent slopes described 100 feet south and 250 feet east of the northwest corner of sec 25, T16.R7E.

A1 -- 0-2 inches; brown (7.5YR 5/2) very bouldery fine sandy loam, dark brown (7.5YR 4/2) when moist; weak medium platey structure; soft, very friable, slightly sticky, slighty plastic; common very fine, fine, medium and few coarse roots; 7 percent boulders, 10 percent cobbles, and 25 percent gravel; slightly calcareous; midly akaline (pH 7.8); abrupt smooth boundary.

C1 -- 2 to 11 inches; light brown (7.5 YR 6/4) gravelly fine sandy loam; strong brown (7.5 YR 5/6) when moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 2 percent stones, 5 percent cobbles and 15 percent gravel; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2 -- 11 to 14 inches; pink (7.5YR 7/4) very cobbley fine sandy loam; reddish yellow (7.5YR 6/6) moist; massive; soft; very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 percent stones, 20 percent cobbles and 25 percent gravels; moderately calcareous, moderately alkaline (pH 8.2); abrupt irregular boundary.

R -- 14 inches sandstone bedrock.

Rock out crop is mostly exposed sandstone and limestone with some areas of shale and coal.

The Strych soil is deep and well drained. It is formed in colluvium and alluvium derived dominantly from sandstone and limestone. Typically the surface is grayish brown very stony loam about 4 inches thick. The subsoil is pale brown very cobbly loam about 4 inches thisk. The substratum is very pale brown very gravelly loam to 60 inches.

Permeability of the Strych soil is moderate. Availabile water capacity is about 7 inches to a depth of 60 inches. Organic matter content of the surface layer is about 2 to 3 percent. Effective rooting depth is about 60 inches. surface runoff is rapid and erosion hazard is high under native vegetation and very high if the vegetation is removed.

Taxonomic classification is loamy-skelatal, mixed, mesic Ustollic Calciorthid.

A typical pedon of Strych very bouldery loam, 50 to 75 percent slopes described 200 feet south, 300 feet cast of the northwest corner of section 25, T16S,R7E.

A -- 0 to 4 inches; grayish brown (10YR 5/2) very stony loam; dark grayish brown (10 YR 4/2), when moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 10 percent boulders, 10 percent cobbles, 20 percent gravel; moderately calcareous; moderately alkaline (pH 8.0); abrupt wavy boundary.

BW -- 4 to 8 inches; pale brown (10YR 6/3) very cobbley loam, yellowish brown (10YR 5/4) when moist; weak fine subangular blocky structure; slightly hard, very friable,

slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 5 percent stones, 15 percent cobbles and 20 percent gravel; moderately clacareous; moderately alkaline (pH 8.0); clear wavy boundary.

BK -- 8 to 36 inches; very pale brown (10YR 8/3) very gravelly loam; light yellowish brown (10YR 6/4) when moist: weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky, plastic; common very fine, fine and few medium and coasre roots; 2 percent stones, 5 percent cobbles and 35 percent gravel; violently calcareous; moderately alkaline (pH 8.5); clear wavy boundary.

C -- 36 to 60 inches; very pale brown (10 YR 7/3) very gravelly loam; brown (10YR 5/3) when moist; massive; slightly hard; friable; slightly sticky, plastic; few very fine roots; 2 percent stones, 10 percent cobbles and 45 percent gravel; moderately calcareous; moderately alkaline (pH 8.4).

THE DATINO SERIES ARE VERY DEEP WELL DRAINED SOILS FORMED IN COLLUVIUM FROM SANDSTONE AND SHALE ON MOUNTAINSLOPES AND CANYON SIDESLOPES UNDER DOUGLAS-FIR, GAMBLE OAK, SNOWBERRY, SERVICEBERRY, AND SALINA WILDRYE. MAAT IS 38 TO 45 F., AAP IS 16 TO 20 INCHES, AND FFP IS 60 TO 100 DAYS. A TYPICAL PEDON HAS A BROWN EXTREMELY STONY FINE SANDY LOAM SURFACE LAYER ABOUT 9 INCHES THICK. THE SUBSOIL IS BROWN VERY STONY LOAM 7 INCHES THICK. THE SUBSTRATUM IS PALE BROWN VERY STONY FINE SANDY LOAM TO A DEPTH OF 60 INCHES OR MORE. SLOPES ARE 15 TO 80 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-9	STX-FSL, STV-L, GRV-L	GM-GC, SM-SC	A-2, A-4	15-75	60-80	55-75	40-70	20-55	20-30	5-10
0-9	IL	CL-ML	A-4	0	100	100	85-95	60-75	25-30	5-10
0-9	GR-FSL	SM, GM	A-4, A-2	5-10	65-85	60-75	40-60	25-40	20-25	NP-5
9-16	STV-L, CBV-L	GM-GC	A-4	25-40	60-70	55-65	50-60	35-50	20-30	5-10
16-60	CBV-L, STV-FSL	GM-GC, SM-SC	A-2, A-4	30-60	40-80	35-75	25-60	15-40	20-30	5-10

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-9	15-20	1.25-1.35	0.6-6.0	0.06-0.09	7.4-7.8	-	LOW	.02	1	8	3-5	HIGH	MODERATE
0-9	22-25	1.20-1.30	0.6-2.0	0.16-0.18	7.4-7.8	-	LOW	.28	1	4L	3-5		
0-9	10-15	1.25-1.35	2.0-6.0	0.08-0.12	7.4-8.4	-	LOW	.15	3	8	3-5		
9-16	18-26	1.20-1.30	0.6-2.0	0.09-0.11	7.4-8.4	<2	LOW	.05					
16-60	16-25	1.30-1.45	0.6-6.0	0.06-0.10	7.4-8.4	<2	LOW	.05					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		B	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-SLOPE,LARGE STONES
SEWAGE LAGOON AREAS	L,GR: SEVERE-SEEPAGE,SLOPE STX,STV,GRV: SEVERE-SEEPAGE,SLOPE, LARGE STONES
SANITARY LANDFILL (TRENCH)	SEVERE-SEEPAGE,SLOPE,LARGE STONES
SANITARY LANDFILL (AREA)	SEVERE-SEEPAGE,SLOPE
DAILY COVER FOR LANDFILL	POOR-SMALL STONES,SLOPE

CONSTRUCTION MATERIAL

ROADFILL	15-25% L,GR: FAIR-LARGE STONES,SLOPE 25+% L,GR: POOR-SLOPE 15-25% STX,STV,GRV: POOR-LARGE STONES 25+% STX,STV,GRV: POOR-LARGE STONES,SLOPE
SAND	IMPROBABLE-EXCESS FINES,LARGE STONES
GRAVEL	IMPROBABLE-EXCESS FINES,LARGE STONES
TOPSOIL	POOR-LARGE STONES,AREA RECLAIM,SLOPE

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE,SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-LARGE STONES
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	LARGE STONES,DROUGHTY,SLOPE
TERRACES AND DIVERSIONS	SLOPE,LARGE STONES
GRASSED WATERWAYS	LARGE STONES,SLOPE,DROUGHTY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-LARGE STONES,SLOPE
DWELLINGS WITHOUT BASEMENTS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-SLOPE,LARGE STONES
DWELLINGS WITH BASEMENTS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-SLOPE,LARGE STONES
SMALL COMMERCIAL BUILDINGS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-SLOPE,LARGE STONES
LOCAL ROADS AND STREETS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-SLOPE,LARGE STONES
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	L,GR: SEVERE-SLOPE STX,STV,GRV: SEVERE-LARGE STONES,SLOPE

REGIONAL INTERPRETATIONS

MLRA(S): 47
REV. HKS-JMD. 3-86
LITHIC USTORTHENTS. LOAMY. MIXED (CALCAREOUS). FRIGID

PODO SERIES
STONY

PODO STONY ARE SHALLOW SOMEWHAT EXCESSIVELY DRAINED SOILS FORMED IN SANDSTONE AND LIMESTONE ON MOUNTAIN SLOPES UNDER BLUE GRAMA, INDIAN RICEGRASS, BITTERBRUSH, MANZANITA, PINE AND FIR. MAAT IS 42 TO 45 F. AAP IS 16 TO 20 INCHES. FFP IS 70 TO 90 DAYS. A TYPICAL PROFILE HAS A DARK BROWN VERY STONY SANDY LOAM SURFACE LAYER 6 INCHES THICK. THE UNDERLYING LAYER IS GRAVELLY AND COBBLY. SANDY LOAM UNDERLAIN AT 20 INCHES BY BEDROCK. SLOPES RANGE FROM 10 TO 70 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-6	STV-SL	SM	A-2, A-1	15-45	65-85	60-80	40-60	20-30	20-30	NP-5
0-6	CN-SL, GR-SL	SM, GM	A-1	0-10	60-70	55-65	30-40	15-25	-	NP
0-6	GRV-L	GM-GC	A-2, A-4	10-15	45-55	40-50	35-50	25-40	25-35	5-10
6-15	GR-SL, CB-SL, GR-SCL	SM-SC	A-2, A-4	10-30	75-85	70-80	50-70	30-40	25-35	5-10
15-19	GR-L, GR-CL	GC	A-4, A-6	0	55-65	50-60	40-60	35-50	30-40	5-15
19	UWB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-6	10-15	1.35-1.40	2.0-6.0	0.06-0.08	7.9-8.4	<2	LOW	.05	1	8	.5-1	HIGH	MODERATE
0-6	10-15	1.35-1.40	2.0-6.0	0.07-0.08	8.5-9.0	<2	LOW	.10	1	8	.5-1		
0-6	15-25	1.25-1.30	2.0-6.0	0.10-0.12	8.5-9.0	<2	LOW	.17	1	8	.5-1		
6-15	10-25	1.30-1.40	2.0-6.0	0.08-0.12	7.9-8.4	<2	LOW	.24					
15-19	15-35	1.25-1.30	2.0-6.0	0.10-0.13	7.9-9.0	<2	LOW	.17					
19													

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENT. FROST ACTION
NONE			>6.0			-		10-20	HARD	-		D	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE,DEPTH TO ROCK,SLOPE
SANITARY LANDFILL (TRENCH)	10-15%: SEVERE-DEPTH TO ROCK,SEEPAGE 15+%: SEVERE-DEPTH TO ROCK,SEEPAGE,SLOPE
SANITARY LANDFILL (AREA)	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
DAILY COVER FOR LANDFILL	10-15%: POOR-DEPTH TO ROCK,LARGE STONES 15+%: POOR-DEPTH TO ROCK,LARGE STONES,SLOPE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
DWELLINGS WITHOUT BASEMENTS	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-SLOPE,DEPTH TO ROCK
DWELLINGS WITH BASEMENTS	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
SMALL COMMERCIAL BUILDINGS	SEVERE-SLOPE,DEPTH TO ROCK
LOCAL ROADS AND STREETS	10-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	10-15% STV,CN,GR: SEVERE-DEPTH TO ROCK 15+% STV,CN,GR: SEVERE-SLOPE,DEPTH TO ROCK 10-15%GRV: SEVERE-SMALL STONES,DEPTH TO ROCK 15+% GRV: SEVERE-SMALL STONES,SLOPE,DEPTH TO ROCK

CONSTRUCTION MATERIAL

ROADFILL	10-25%: POOR-DEPTH TO ROCK 25+%: POOR-DEPTH TO ROCK,SLOPE
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	10-15%: POOR-DEPTH TO ROCK,SMALL STONES 15+%: POOR-DEPTH TO ROCK,SMALL STONES,SLOPE

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-DEPTH TO ROCK,SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-THIN LAYER
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	CN,GR,GRV: SLOPE,DROUGHTY STV: SLOPE,LARGE STONES,DROUGHTY
TERRACES AND DIVERSIONS	SLOPE,LARGE STONES,DEPTH TO ROCK
GRASSED WATERWAYS	LARGE STONES,SLOPE,DROUGHTY

REGIONAL INTERPRETATIONS

SA(S): 29, 35
O.CDF, 12-FF
TOLLIC CALCIOFTHIUS, LOAMY-SKELETAL, MIXED, MESIC

STRYCH SERIES
HIGH ELEVATION

E STRYCH SERIES ARE VERY DEEP, WELL DRAINED SOILS FORMED IN ALLUVIUM AND COLLUVIUM ON HILLSIDES AND MOUNTAINSIDES
DER UTAH JUNIPER PINYON. MAAT IS 45 TO 50 DEGREES F., AAP IS 12 TO 14 INCHES. FFS IS 100 TO 150 DAYS. TYPICALLY THE
ACE IS REDDISH BROWN EXTREMELY BOULDERY FINE SANDY LOAM 8 INCHES THICK. THE UNDERLYING MATERIAL IS YELLOWISH RED AND
ISH YELLOW VERY STONY FINE SANDY LOAM AND EXTREMELY STONY FINE SANDY LOAM TO A DEPTH OF 60 INCHES OR MORE. SLOPES
GE FROM 20 TO 70 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-8	FYX-FSL, STX-FSL	SM-SC, SM	A-2, A-4	40-80	65-90	60-80	50-75	25-50	20-30	NP-10
8-60	STV-FSL, CBV-FSL	SM-SC, GM-GC	A-2, A-4	30-50	45-75	40-70	30-70	20-45	20-30	NP-10
	STV-FSL, STX-FSL, CBV	SM-SC, GM-GC	A-2, A-4	30-50	45-75	40-70	30-70	20-45	20-30	5-10

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-8	8-18	1.20-1.45	2.0-6.0	0.06-0.11	7.4-8.4	-	LOW	.20	5	8	1-3	HIGH	MODERATE
8-60	14-18	1.20-1.45	2.0-6.0	0.06-0.11	7.4-8.4	-	LOW	.20	5	8	1-3		
		1.20-1.45	2.0-6.0	0.06-0.11	7.4-9.0	<2	LOW	.20					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		B	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-SLOPE,LARGE STONES
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE,SLOPE,LARGE STONES
SANITARY LANDFILL (TRENCH)	SEVERE-SLOPE,LARGE STONES
SANITARY LANDFILL (AREA)	SEVERE-SLOPE
DAILY COVER FOR LANDFILL	POOR-SMALL STONES,SLOPE

CONSTRUCTION MATERIAL

ROADFILL	20-25% STV,CBV: FAIR-LARGE STONES,SLOPE 25+% STV,CBV: POOR-SLOPE 20-25% FYX,STX: POOR-LARGE STONES 25+% FYX,STX: POOR-LARGE STONES,SLOPE
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-SMALL STONES,AREA RECLAIM,SLOPE

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE,SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-LARGE STONES
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,LARGE STONES,DROUGHTY
TERRACES AND DIVERSIONS	SLOPE,LARGE STONES
GRASSED WATERWAYS	TOO ARID,LARGE STONES,SLOPE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-LARGE STONES,SLOPE
DWELLINGS WITHOUT BASEMENTS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-SLOPE,LARGE STONES
DWELLINGS WITH BASEMENTS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-SLOPE,LARGE STONES
SMALL COMMERCIAL BUILDINGS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-SLOPE,LARGE STONES
LOCAL ROADS AND STREETS	STV,CBV: SEVERE-SLOPE FYX,STX: SEVERE-SLOPE,LARGE STONES
PLAYGROUNDS, CAMPING AND GOLF FAIRWAYS	FYX,STX: SEVERE-LARGE STONES,SLOPE STV,CBV: SEVERE-SMALL STONES,LARGE STONES, SLOPE

REGIONAL INTERPRETATIONS

ALRAGS): 34, 47
REV. JMD, 3-83
TYPIC USTORTHENTS, FINE-LOAMY, MIXED (CALCAREOUS), FRIGID

THE SHEEPCAN SERIES CONSISTS OF VERY DEEP, WELL DRAINED SOILS THAT FORMED IN COLLUVIUM FROM SEDIMENTARY ROCKS ON MOUNTAIN SLOPES UNDER SALINA WILDRYE, BIG SAGEBRUSH, RUBBER RABBITBRUSH, BLUEBUNCH WHEATGRASS, AND SNOWBERRY. MAST IS 38 41F. AAP IS 16 TO 18 INCHES. FFP IS 70 TO 85 DAYS. A TYPICAL PROFILE HAS A LIGHT BROWNISH GRAY GRAVELLY LOAM SURFACE TER 9 INCHES THICK. THE UNDERLYING LAYER IS LIGHT GRAY AND PALE YELLOW GRAVELLY AND COBBLY CLAY LOAM 19 INCHES THICK. E NEXT LAYER IS WHITE VERY COBBLY CLAY LOAM TO 60 INCHES OR MORE. SLOPES ARE 5 TO 20 PERCENT.

ESTIMATED SOIL PROPERTIES (A)

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRAGM >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-9	GR-L	CL-ML, GM-GC, SM-SC	A-4	0-10	70-80	65-75	60-70	40-60	25-30	5-10
8-9	ST-L	CL-ML, SM-SC	A-4	15-30	75-85	70-80	60-75	40-60	25-35	5-10
9-28	GR-CL, CB-CL	CL	A-6	5-30	70-80	65-75	60-70	50-55	30-40	10-20
28-60	CBV-CL	GC	A-6	30-40	55-65	50-65	45-60	35-50	30-40	10-20

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-9	22-25	1.35-1.45	0.2-0.6	0.12-0.14	7.9-8.4	<2	LOW	.17	5	8	1-3	HIGH	MODERATE
0-9	23-25	1.35-1.45	0.2-0.6	0.11-0.13	7.9-8.4	<2	LOW	.15	5	8	1-3		
9-28	28-35	1.30-1.40	0.2-0.6	0.12-0.14	8.5-9.0	<2	MODERATE	.17					
28-60	28-35	1.30-1.40	0.2-0.6	0.09-0.11	7.9-9.0	<2	LOW	.10					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-	-	B	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-PERCS SLOWLY.
SEWAGE LAGOON AREAS	SEVERE-SLOPE
SANITARY LANDFILL (TRENCH)	GR: SEVERE-SLOPE ST: SEVERE-SLOPE,LARGE STONES
SANITARY LANDFILL (AREA)	SEVERE-SLOPE
DAILY COVER FOR LANDFILL	POOR-SMALL STONES.

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-SLOPE >15%
DWELLINGS WITHOUT BASEMENTS	SEVERE-SLOPE >15%
DWELLINGS WITH BASEMENTS	SEVERE-SLOPE >15%
SMALL COMMERCIAL BUILDINGS	SEVERE-SLOPE
LOCAL ROADS AND STREETS	SEVERE-SLOPE >15%
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-SLOPE >15%

CONSTRUCTION MATERIAL

ROADFILL	5-25%: FAIR-LARGE STONES,SLOPE 25+%: POOR-SLOPE
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-SMALL STONES,AREA RECLAIM.

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SLOPE
EMBANKMENTS DIKES AND LEVEES	MODERATE-LARGE STONES
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	LARGE STONES,SLOPE
TERRACES AND DIVERSIONS	SLOPE,LARGE STONES
GRASSED WATERWAYS	LARGE STONES,SLOPE

REGIONAL INTERPRETATIONS

"LRAIS): 47
JWB,JPD, 2-82

WINETTI SERIES
BOULDERY

TYPIC USTIFLUVENTS, LOAMY-SKELETAL, MIXED (CALCAREOUS), FRIGID

THE WINETTI SERIES IS VERY DEEP, WELL DRAINED SOIL FORMED IN ALLUVIUM FROM SANDSTONE AND SHALE ON NARROW VALLEY FLOORS UNDER BASIN SHRUBS AND GRASSES. MAAT IS 43 TO 45F. AAP IS 12 TO 16 INCHES. FFP IS 80 TO 100 DAYS. TYPICALLY THE SURFACE LAYER IS GRAYISH BROWN BOULDERY SANDY LOAM ABOUT 6 INCHES THICK. THE UNDERLYING LAYER IS PALE BROWN LOAM 5 INCHES THICK. THE NEXT LAYER IS PALE BROWN AND BROWN VERY BOULDERY LOAM ABOUT 23 INCHES THICK. THE NEXT LAYER TO A DEPTH OF 60 INCHES IS PALE BROWN VERY GRAVELLY SANDY LOAM. SLOPES ARE 1 TO 8 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-6	BY-SL	SM	A-2, A-4	35-45	95-100	90-100	55-70	30-40	20-25	NP-5
6-11	L	CL-ML, ML	A-4	0	90-100	85-95	70-90	55-70	20-30	NP-10
11-34	BYV-L	CL-ML, ML	A-4	40-45	75-85	70-80	60-70	45-55	20-30	NP-10
34-60	GRV-SL	GM-GC, GM	A-2	15-20	40-50	35-45	20-30	15-20	20-30	NP-10

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND ERODIBILITY GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-6	8-13	1.30-1.40	2.0-6.0	0.06-0.08	7.4-7.8	<2	LOW	.15	2	8	1-3	HIGH	MODERATE
6-11	10-17	1.20-1.30	2.0-6.0	0.15-0.17	7.9-8.4	<2	LOW	.37					
11-34	10-17	1.20-1.30	2.0-6.0	0.08-0.10	7.9-8.4	<2	LOW	.10					
34-60	10-16	1.30-1.40	2.0-6.0	0.05-0.07	7.9-8.4	<2	LOW	.10					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
RARE			>6.0			-		>60		-	-	I	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	MODERATE-FLOODING,LARGE STONES
SEWAGE LAGOON AREAS	1-7%: SEVERE-SEEPAGE,FLOODING 7+%: SEVERE-SEEPAGE,FLOODING,SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-SEEPAGE
SANITARY LANDFILL (AREA)	SEVERE-SEEPAGE
DAILY COVER FOR LANDFILL	POOR-SMALL STONES

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	MODERATE-LARGE STONES
DWELLINGS WITHOUT BASEMENTS	SEVERE-FLOODING
DWELLINGS WITH BASEMENTS	SEVERE-FLOODING
SMALL COMMERCIAL BUILDINGS	SEVERE-FLOODING
LOCAL ROADS AND STREETS	MODERATE-FLOODING,FROST ACTION,LARGE STONES
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-LARGE STONES

CONSTRUCTION MATERIAL

ROADFILL	FAIR-LARGE STONES
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-LARGE STONES,AREA RECLAIM

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-SEEPAGE,LARGE STONES
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	1-3%: LARGE STONES,DROUGHTY 3+%: LARGE STONES,DROUGHTY,SLOPE
TERRACES AND DIVERSIONS	LARGE STONES,ERODES EASILY
GRASSED WATERWAYS	LARGE STONES,ERODES EASILY,DROUGHTY

REGIONAL INTERPRETATIONS

REV. 03/2?/?? 6-??

LITHIC LYTIC TORRIORTHENTS, LOAMY, MIXED (CALCAREOUS), MESIC

TRAVESSILLA SERIES
COOL

THE TRAVESSILLA SERIES ARE SHALLOW WELL DRAINED SOILS FORMED IN RESIDUUM AND COLLUVIUM FROM SANDSTONE AND SILTSTONE ON BENCHES, MESAS AND CANYON SIDESLOPES UNDER PINYON AND JUNIPER. MAAT IS 45 TO 47 F.. MAP IS 12 TO 14 INCHES, AND FFP IS 90 TO 120 DAYS. A TYPICAL PROFILE HAS A BROWN SANDY LOAM SURFACE LAYER 3 INCHES THICK. THE UNDERLYING MATERIAL IS BROWN OR LIGHT BROWN LOAM OVER SANDSTONE AT A DEPTH OF 17 INCHES. SLOPES RANGE FROM 1 TO 80 PERCENT.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-3	SL, FSL, FL-SL	SM-SC	A-2, A-4	0-10	90-100	85-100	55-80	30-40	20-25	5-10
0-3	CRV-FSL	GM-GC	A-1, A-2	0-5	35-45	30-40	25-35	10-20	20-25	5-10
0-3	BYX-L	GM-GC	A-2	55-65	40-50	35-45	30-40	25-30	20-25	5-10
3-17	L, VFSL, FSL	CL-ML, SM-SC	A-4	0-5	90-100	70-100	60-80	45-65	20-25	5-10
17	UWB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL HIGH	CONCRETE LOW
0-3	10-16	1.30-1.40	2.0-6.0	0.11-0.15	7.4-7.8	-	LOW	.24	1	3	1-2		
0-3	12-18	1.30-1.40	2.0-6.0	0.06-0.08	7.4-7.8	-	LOW	.10	1	6	1-2		
0-3	15-18	1.15-1.25	0.6-2.0	0.06-0.08	7.9-8.4	<2	LOW	.05	1	8	1-2		
3-17	8-18	1.30-1.40	0.6-6.0	0.13-0.16	7.4-8.4	<2	LOW	.37					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYDROLOGIC GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		6-20	HARD	-		C	MODERATE

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
SEWAGE LAGOON AREAS	1-7%: SEVERE-SEEPAGE,DEPTH TO ROCK 7+%: SEVERE-SEEPAGE,DEPTH TO ROCK,SLOPE
SANITARY LANDFILL (TRENCH)	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
SANITARY LANDFILL (AREA)	1-8%: SLIGHT 8-15%: MODERATE-SLOPE 15+%: SEVERE-SLOPE
DAILY COVER FOR LANDFILL	1-15%: POOR-DEPTH TO ROCK 15+%: POOR-DEPTH TO ROCK,SLOPE

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
DWELLINGS WITHOUT BASEMENTS	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-SLOPE,DEPTH TO ROCK
DWELLINGS WITH BASEMENTS	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
SMALL COMMERCIAL BUILDINGS	1-8%: SEVERE-DEPTH TO ROCK 8+%: SEVERE-SLOPE,DEPTH TO ROCK
LOCAL ROADS AND STREETS	1-15%: SEVERE-DEPTH TO ROCK 15+%: SEVERE-DEPTH TO ROCK,SLOPE
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SL,FSL,FL,GRV: SEVERE-DEPTH TO ROCK BYX: SEVERE-LARGE STONES,DEPTH TO ROCK

CONSTRUCTION MATERIAL

ROADFILL	1-25%: POOR-DEPTH TO ROCK 25+%: POOR-DEPTH TO ROCK,SLOPE
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	1-15%: POOR-DEPTH TO ROCK,SMALL STONES 15+%: POOR-DEPTH TO ROCK,SMALL STONES,SLOPE

WATER MANAGEMENT

POND RESERVOIR AREA	1-8%: SEVERE-DEPTH TO ROCK 8+%: SEVERE-DEPTH TO ROCK,SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	1-3% GRV-FSL,BYX-L: DEPTH TO ROCK 3+% GRV-FSL,BYX-L: SLOPE,DEPTH TO ROCK 1-3% SL,FSL,FL-SL: SOIL BLOWING,DEPTH TO ROCK 3+% SL,FSL,FL-SL: SLOPE,SOIL BLOWING, DEPTH TO ROCK
TERRACES AND DIVERSIONS	1-8% SL,FSL,FL,GRV: DEPTH TO ROCK 8+% SL,FSL,FL,GRV: SLOPE,DEPTH TO ROCK 1-8% BYX: LARGE STONES,DEPTH TO ROCK 8+% BYX: SLOPE,LARGE STONES,DEPTH TO ROCK
GRASSED WATERWAYS	1-8% SL,FSL,FL,GRV: TOO ARID 8+% SL,FSL,FL,GRV: TOO ARID,SLOPE 1-8% BYX: TOO ARID,LARGE STONES 8+% BYX: TOO ARID,LARGE STONES,SLOPE

REGIONAL INTERPRETATIONS

Appendix 2-F

Wild Horse Ridge
Soil Resource Inventory and Assessment

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT

Soil Resource Inventory and Assessment

Prepared for
C.W. Mining
P. O. Box 1245
Huntington, UT 84528

Prepared by:
Environmental Industrial Services
31 North Main
Helper, UT 84526

May 1999

DETAILED SOIL RESOURCE INVENTORY AND ASSESSMENT

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL
EMERY COUNTY, UTAH

FOR
C. W. Mining Company

Environmental Industrial Services
31 North Main
Helper, Utah 84526

BY
Daniel M. Larsen
Professional Soil Scientist

May 1999

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4.0 APPENDICES
- A. SOIL SUITABILITY CRITERIA
- B. SOIL LABORATORY TESTING RESULTS
- C. FIELD SOIL PROFILE DESCRIPTIONS AND TRANSECT DATA
- D. SOIL PROFILE AND LANDSCAPE PHOTOGRAPHS
- E. NRCS SOIL SERIES DESCRIPTIONS
- F. COMPARISON OF SOIL SURVEY MAP UNITS

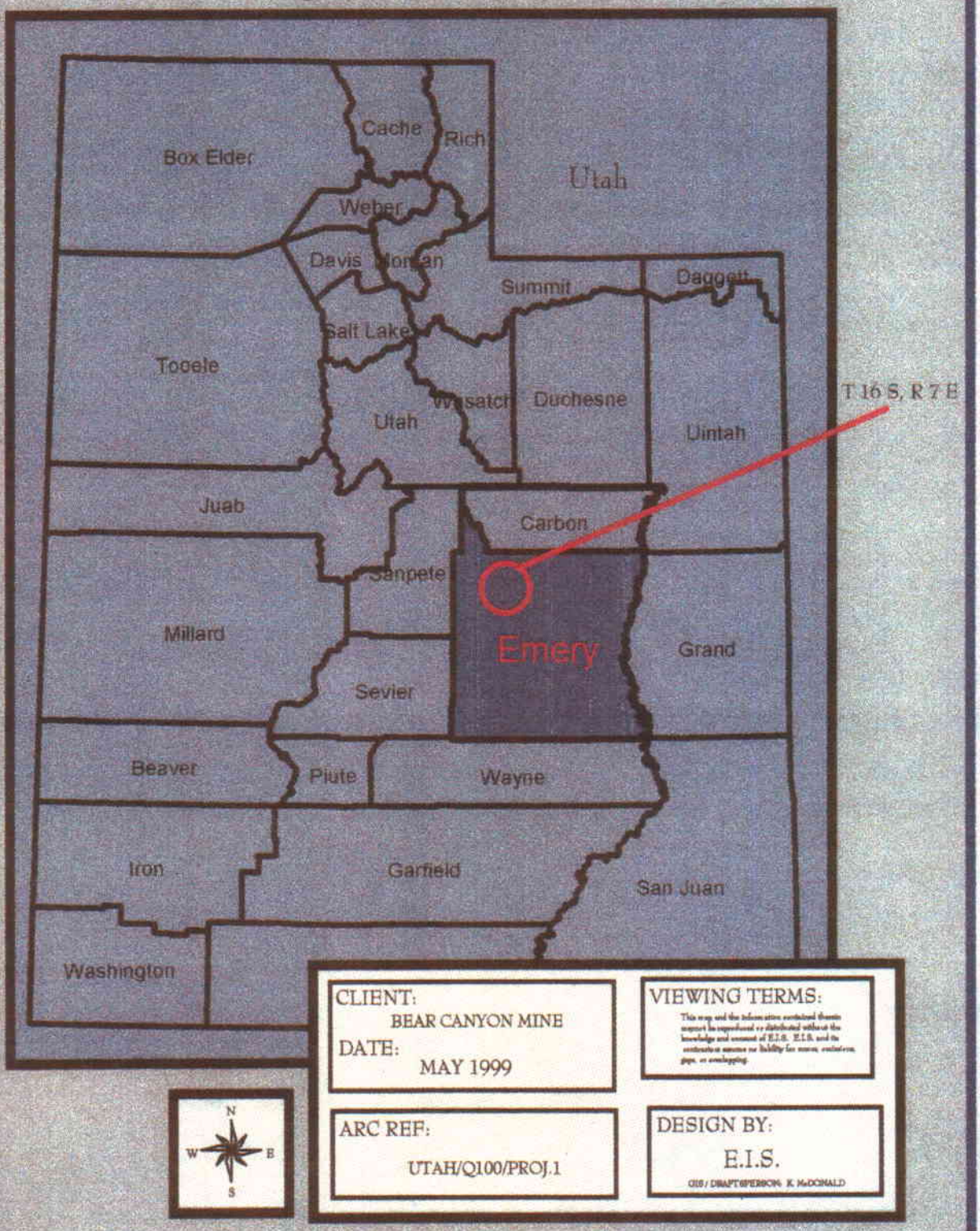
5.0 MAPS
- A. DETAILED SOIL SURVEY MAP
- B. SOIL DATA COLLECTION MAP
- C. SOIL SUITABILITY MAP

BEAR CANYON MINE

Wild Horse Ridge Portal Project

Emery County, Utah

Figure 1: Location Map



CLIENT:
BEAR CANYON MINE

DATE:
MAY 1999

VIEWING TERMS:
This map and the information contained therein cannot be reproduced or distributed without the knowledge and consent of E.I.S. E.I.S. and its contractors assume no liability for errors, omissions, gaps, or overlapping.

ARC REF:
UTAH/Q100/PROJ.1

DESIGN BY:
E.I.S.
GIS / DRAFTSPERSON: K. McDONALD

1.0 INTRODUCTION

1.1 LOCATION AND SETTING

This report presents soils information compiled from a detailed soil survey (order one intensity level) of the proposed Wild Horse Ridge Portal Project at the Bear Canyon Mine, Emery County, Utah. The study area is located about eight miles northwest of the town of Huntington; S24, T16S, R7E (Fig. 1). The project is an extension of the existing Bear Canyon Mine operated by C. W. Mining Company. It includes development of a portal site, conveyor, and access road. The main access road has been constructed, but may need upgrading. The total potential disturbed area is approximately six acres; which includes about one mile of road, 0.6 miles of conveyor corridor, and about 1.5 acres at the portal site.

The study area is located along the eastern edge of the Wasatch Plateau physiographic section. It is in a narrow, steeply sloping canyon cut in sandstone and shale bedrock at the south end of Gentry Mountain. The elevation ranges from about 7,130 to 7,710 feet, and annual precipitation is about 15 to 18 inches. Vegetation includes Pinion-juniper types of the more southerly facing slopes and Douglas-fir on the cooler north facing slopes.

1.2 OBJECTIVES

The detailed soil survey was conducted to provide sufficient information on the existing soil resources for the development and reclamation of the proposed portal, conveyor, and access road. The objectives were to document physical and chemical properties of the soils and assess soil suitability and limitations related to the proposed activities. One objective was to determine the amount of suitable soil materials available for reclamation purposes. This material sometimes referred to as topsoil, is the soil material which has properties that are suitable for growth of native plant species. Included in the soil survey are maps showing the distribution of different soil types and the thickness of salvageable soil materials, descriptions of the soils, soil laboratory test results, and photographs of soils and the landscape.

The information presented is to fulfill the soil survey and assessment requirements of the Utah Department of Natural Resources; Division of Oil, Gas, and Mining (UDOGM); pertaining to management of topsoil and overburden for mining.

2.0 METHODS AND PROCEDURES

2.1 DATA REVIEW AND EVALUATION

The project area had been mapped at the order two soil survey intensity level as part of a soil survey of the Bear Canyon Mine area by the USDA Natural Resources Conservation Service. This information was provided by Leland Sasser, Soil Scientist, NRCS, Price, Utah. Co-op Mining Company collected 14 soil samples from four different sites in the project area and submitted them to Inter-Mountain Laboratories, Farmington, New Mexico for analysis. This information base was fairly good; but more site specific documentation of soil descriptions, more detailed mapping, and further analysis was needed to meet the requirements of an order one (detailed) soil survey.

2.2 SOIL INVENTORY AND MAPPING

Soil inventory and mapping was conducted at the order one intensity level during April, 1999, by Daniel M. Larsen, Professional Soil Scientist. Field assistance was provided by Carl East, Biologist, E.I.S. Field mapping was done at a scale of one inch equal to 200 feet. Soil descriptions were obtained from hand dug soil pits and soils exposed on road cuts. Four of the soil descriptions were taken at the sites where Co-op Mining Company had taken soil samples for testing in 1996. Data collection consisted of a total of 25 points, as well as appropriate notes and photographs.

Documentation of field data is presented in Map B-Soil Data Collection Map; Appendix C-Field Soil Profile Descriptions and Transect Data; and Appendix D-Soil Profile and Landscape Photographs.

2.3 SOIL PROFILE (PEDON) DESCRIPTIONS

Soil profile descriptions, technically referred to as pedon descriptions, were recorded from a cleaned off representative section of the soil pit wall. Descriptions were taken on form SCS-Soils-232G and completed according to methods and standards of the National Cooperation Soil Survey as described in: the Soil Survey Manual (Soil Survey Staff, 1993); the National Soil Survey Handbook (Soil Survey Staff, 1993); and Keys to Soil Taxonomy, seventh edition (Soil Survey Staff, 1996).

The following parameters were described for each soil pedon description:

- horizon symbol, depth, thickness, and relative position;
- clarity and continuity of horizon boundaries;
- soil color (Munsell), both moist and dry;
- texture (fine earth fraction - <2mm);
- rock fragment content [type and size - (gravel - 2mm to 3"), (cobble - 3" to 10"), (stone - 10" to 2'), (boulder - >2'), and amount - % by volume];
- soil structure (type, size and grade);
- roots (size and abundance);
- clay films, if present (number, thickness, location);
- effervescence with 0.1N HC1 (none, slight, moderate, strong, violent);

In addition, the following soil and general site features were also described:

- existing dominant vegetation
- climate (moisture and temperature regimes)
- parent material
- physiography-landform
- relief
- elevation (obtainable from topographic maps)
- slope
- aspect
- erosion condition
- permeability

- drainage class
- depth to a saturated zone or ground water if encountered
- salts or alkali if present
- surface stoniness

2.4 SOIL SAMPLING AND LABORATORY ANALYSIS

Seven soil samples were selected during this inventory and submitted to Inter-Mountain Laboratories, Inc., Farmington, New Mexico, to supplement the data previously obtained by Co-op Mining Company. The samples were taken from representative soil layers and placed in clean plastic bags. About four to five pounds of each sample was sent to the laboratory on April 8, 1999. Laboratory testing results were received on May 5, 1999.

The following parameters were included in the soil analysis:

PH
Electrical conductivity
Saturation percentage
Sodium Absorption Ration
    includes Ca, Mg, and Na in meq/L
Mechanical Analysis
    includes % very fine sand, sand, silt, clay, and texture classification
Total Organic Carbon
    includes calculation for % organic matter
% Calcium carbonate
Boron ($CaCl_2$ extraction)
Selenium (AB-DPTA extraction)
Available water capacity
    includes 1/3 bar and 15 bar analyses
Exchangeable sodium percentage
    includes available Na, exchangeable Na, and cation exchange capacity.
    Analyzed only if SAR > 15 for sandy soils or >12 for clays

This list of parameters for testing was compiled through communications with Robert A. Davidson, Reclamation Soil Scientist, State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (August 1997). Mr. Davidson has also communicated with Inter-Mountain Laboratories, Inc., to assure that approved laboratory methods were used.

The 14 soil samples submitted by Co-op Mining Company in 1996, were tested for a slightly different array of parameters.

2.5 SOIL SUITABILITY FOR SALVAGE

Criteria to establish suitability of soil (topsoil) or soil substitute material were those contained in Table 2 of UDOGM "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining," included as Appendix A. Although the UDOGM suitability criteria considers >30% (by volume) rock fragments (for both gravels <3" in size and cobbles 3 to 10" in size) to be unacceptable, and >10% stones and boulders >10" in size to also be unacceptable, recent discussion with Robert Davidson (Nyenhuis 1997) indicates his preference for salvaging soil with higher rock content. Although unacceptable thresholds were not set, the general idea is to salvage otherwise suitable soil with higher amounts of rock content in the soil than typical.

Potential salvage depths were determined for each map unit based on an evaluation of all of the field and laboratory data.

3.0 RESULTS AND DISCUSSION

3.1 SOIL SURVEY MAP

A detailed soil survey map was compiled at a scale of one inch equal 200 feet for the proposed Wild Horse Ridge Portal Project area. This map is shown as Map A. Seven soil map units were identified which represent areas having differences related to soil and landscape characteristics.

These soil map units are:

A. Pathead-Cabba Complex, 30 to 70% slopes

B. Winetti, High elevation; 5 to 30% slopes

C. Winetti, High elevation-Rock outcrop; 10 to 30% slopes

D. Doney, Deep; 10 to 30% slopes

E. Datino-Guben Complex, 30 to 80% slopes

F. Guben-Pathead Complex, 30-80% slopes

G. Doney-Cabba-Podo Complex, 30 to 80% slopes

These soil map units are specific to the project area and are slightly different than the units previously mapped by the Natural Resources Conservation Service at a broader level. Statements comparing the soil map units of these two inventories are given in Appendix F.

3.2 SOIL MAP UNIT DESCRIPTIONS

The seven soil map units identified in this inventory were given alphabetical symbols for simplicity. Map unit names are based on the dominant soil series present and steepness of the slopes. A soil series name is a name given to a soil that has a specific range of properties. Soil series descriptions for the soils common to this inventory are presented in Appendix E.

A general description of each of the soil map units is given below. In addition, soil map unit features are summarized in Table 3.2A.

Soil Map Unit A: Pathead-Cabba Complex 30 to 70% Slopes.

This soil map unit is on convex foot slopes supporting a Pinion-juniper vegetation type. Slope gradients are 30 to 70 percent. Soils have formed in stony colluvium and shale. They are well-drained and range from shallow to deep.

TABLE 3.2A-SOIL MAP UNIT FEATURES
WILD HORSE RIDGE PORTAL PROJECT

MAP UNIT	LAND FORMS	% SLOPE	PARENT MATERIAL	SOIL DEPTH	TEXTURES	ROCK FRAGMENT CLASS	GENERAL VEGETATION
A	Foothills	30-70%	Colluvium and Shale	Shallow to Deep	sl,l,cl	Stony to very cobbly	Pinion-Juniper
B	Narrow Canyon Bottoms	5-30%	Alluvium and Colluvium	Deep	sl,l,ls	Gravelly to Bouldery	Cottonwood Douglas-fir, Dogwood, Wildrose
C	Narrow Canyon Bottoms	5-30%	Alluvium, Colluvium and Sandstone	Shallow to Deep	sl,l,ls	Gravelly to Bouldery	Cottonwood Douglas-fir, Dogwood, Wildrose
D	Toeslope Slight Bench	10-30%	Colluvium, Slope Wash	Deep	sl,l,ls	Non-stony to stony	Ponderosa Pine, Juniper, Douglas-fir
E	Steep Canyon Slope, North Aspect	30-80%	Colluvium, and Shale	Moderate Deep to Deep	sl,l,cl	Very stony to non-stony	Douglas-fir Pinion, Mountain Mahogany, Serviceberry
F	Canyon Side Slope	30-80%	Colluvium, Sandstone, and Shale	Shallow to Moderate Deep	sl,l,cl	Very stony to bouldery	Douglas-fir Pinion, Mountain Mahogany
G	Steep Canyon Slope, South Aspect	30-80%	Sandstone, Shale, and Colluvium,	Shallow to Moderate Deep	sl,l,cl	Very stony to non-stony	Pinion, Juniper, Grass

The Pathead soils are weakly developed soils formed in stony colluvium derived dominantly from sandstone. Soil textures include sandy loam, loam, and clay loam. They are very cobbly to very stony. The surface layer in typically dark brown or dark grayish brown sandy loam about 3 to 4 inches thick. This is underlain by brown to yellowish-brown, very stony sandy loam to clay loam. Dept to bedrock is 20 inches or more.

The Cabba soils are shallow over shale. They are weakly developed and less than 20 inches to shale bedrock. The surface may have some gravelly or cobbly colluvium influence, but the soil profile is relatively stone free. Soil colors are dark grayish brown to dark brown and textures are loam and clay loam.

SOIL MAP UNIT B: WINETTI, HIGH ELEVATION, 5 TO 30% Slopes

This map unit is along the drainage bottom where soils have formed in alluvial and colluvial deposits derived from sandstone and shale. It occurs on a high gradient; ephemeral drainage system which lacks a well-defined bottom land. Vegetation is made up of a variety of species including Douglas-fir, Cottonwood, Ponderosa Pine, Dogwood, and Wild Rose.

Soils are mostly very gravelly to bouldery sandy loam or loam. They are similar to the Winetti soil series, which is typically at lower elevations with warmer temperatures. Sites in this canyon bottom are cool, and based on the vegetation are approaching a cryic temperature regime.

These soils are typically well-drained and have moderately rapid permeability. They show little soil profile development in the form of soil horizons. Topsoil layers are thin and subsoils are primarily a mixture of parent materials.

Included in the unit are segments of the existing access road and some side cast material from road construction.

SOIL MAP UNIT C: WINETTI HIGH ELEVATION-ROCK OUTCROP, 10 TO 30% SLOPES

This map unit occurs at the upper end of the drainage bottom in the project area. It consists of a narrow canyon bottom with steep side slopes. Rock outcrop is common, and in places the streambed is bedrock. Large boulders and stones are also common. This unit is similar to Soil Map Unit B, but is on a narrower and more rocky section along the drainage.

The soils are very gravelly to bouldery sandy loam, loam, and loamy sand. They range from shallow to deep and show little soil profile development. Only thin topsoil layers are present, with a mixture of material below.

SOIL MAP UNIT D: DONEY, DEEP; 10 TO 30% SLOPES

This map unit occurs on a small bench at the toe of a steep canyon slope. It is near the drainage bottom, but appears to have formed mostly from local slope wash and colluvium from the adjacent slopes. It is a gently sloping site compared to most of the project area and has deep soils supporting several large Ponderosa Pines trees. Field observations indicate that these soils are underlain by shale.

The soil in this map unit was grouped with the Doney soil family. Most of the unit appears to have soils that are deeper than 40 inches compared to the typical Doney family of 20 to 40 inches in depth.

Soils are brown to dark yellowish brown sandy loam and loam. The topsoil layer is thin and slightly darker colored than the remainder of the soil profile. Rock fragment content is less than 30 percent. The soils are well-drained and have moderate permeability.

SOIL MAP UNIT E: DATINO-GUBEN COMPLEX, 30 TO 80% SLOPE

This map unit occurs on a steep, north-facing canyon slope. Soil materials are primarily stony colluvium, although there are inclusions of shale where the colluvium is thin or lacking and also some mixed soil material that was side cast during road construction, Vegetation includes: Douglas-fir, Serviceberry, Curleaf Mountain Mahogany, and scatter Pinion and Juniper.

Soils include the Datino and Guben series and other similar soils. These soils have a high rock fragment content and a dark colored surface layer of about 6 to 8 inches in thickness. The Guben soils have a distinct calcium carbonate accumulation at about 20 to 30 inches. Other similar soils have the characteristics of the Datino and Guben soils, but the surface soil layer is slightly lighter in color.

The soils are well-drained and typically have textures of loam or sandy loam. They are typically deep and moderately permeable.

Included in this map unit are some soils that are less stony and are typically associated with shale where the colluvial deposits are thin or lacking. These soils account for less then 5 percent of the unit, but are contrasting to the dominant soils.

Material that was side cast from road construction consists of a soil that is typically a brown stony or very cobbly sandy loam of 1 to 3 feet in thickness over the original soil.

SOIL MAP UNIT F: GUBEN-PATHEAD COMPLEX, 30 TO 80% SLOPES

This map unit is on a steep, north-facing canyon side slope along the access road. It is up slope from Soil Map Unit E and has shallower soils with more sandstone bedrock present. Slopes are 30 to 80 percent in gradient. The soils have formed mostly in stony colluvial deposits which range from about 2 to 6 feet in thickness. Some sandstone rocks outcrop its present in the unit. Vegetation includes: Douglas-fir, Pinion Pine, Bristlecone Pine, Curleaf Mountain Mahogany, and Serviceberry.

The Guben soils typically have a dark colored surface layer (mollic) about 7 to 10 inches thick and a calcium carbonate accumulation at about 20 to 30 inches. They are very cobbly to very stony, with textures of sandy loam and loam. Soil depths are generally greater than 40 inches to bedrock.

The Pathead soils consist of moderately deep, weakly developed soils formed in very stony or cobbly colluvium and residual materials derived dominantly from sandstone. They have very thin topsoil layers and the parent materials are relatively unaltered by soil development processes. These soils are typically underlain by sandstone bedrock at 20 to 40 inches in depth.

Included in this map unit are about 10 percent Datino soils which are similar to Guben, but lack a calcic horizon.

SOIL MAP UNIT G: DONEY-CABBA-PODO COMPLEX, 30 TO 80% SLOPES

This soil map unit occurs on the steep, rocky, south-facing canyon slope near the proposed portal site. The soil components consist of shallow and moderately deep soils over sandstone and shale. The basic vegetation is a Pinion-juniper type.

The Doney soils are moderately deep (20 to 40 inches) and typically have less than 35 percent rock fragment content in the soil profile. They are well-drained and moderately permeable. Soil colors are typically dark brown and brown and textures are loam and sandy loam.

The Cabba soils are shallow (less than 20 inches) over shale bedrock. They typically have dark grayish brown and brown colors and textures of clay loam and loam. Permeability is restricted by the shallow depth to shale.

Podo soils are shallow over sandstone bedrock. They are typically loam or sandy loam in texture and are well-drained.

3.3 SOIL LABORATORY TESTING RESULTS

The soil laboratory testing results are shown in Appendix B. Included are the testing results from the samples submitted by Co-op Mining Company in 1996 (coded WHRS) and those from this field inventory (coded CW). The CW identification corresponds to this project under C. W. Mining Company.

A summary of the soil testing data is given below for twenty soil samples (excluding CW 10-1):

PARAMETER	RANGE	RATING*
pH	6.7 – 7.8	Good
EC (mmhos/cm)	0.33 - 1.31	Good
Saturation %	30 — 49	Good
SAR	0.15– 0.7	Good
Texture	SCL,SI6,SL,L	Good
Boron (mg/Kg)	0.19– 1.6	Good
Selenium (mg/Kg)	<0.02	Good
CaCO3 % **	15.9– 26.4	Fair
Avail, Water Cap. (in/in)	0.06- 0.14	Fair to Good
Organic Matter % **	0.79- 2.6	Not Rated

*Rating based on soil suitability criteria, Table 2, Appendix A
**CW samples only

Soil tests indicate that the soils generally rate fair to good as material for reclamation. Only one soil sample showed notable variation from the others. Soil sample CW10-1 was taken from a light colored soil layer at about 20 to 30 inches in depth on a road cut in Soil Map Unit F. The sample was taken to document properties of a calcic horizon in a soil identified as Guben. Surprisingly, the soil test results indicated an unacceptable level of selenium and a poor rating for electrical conductivity (EC). The selenium level was reported at 0.26 mg/Kg which is over 100 times higher than all 20 of the other samples (all <0.02 mg/Kg). The sample was also higher in boron, calcium, magnesium, sodium, SAR and pH than other soil samples. The sample site is at the edge of the existing road accessing the portal site. It is not anticipated that this soil would be involved in disturbance needed for portal site development. Further assessment may be required if disturbances along this section of road is proposed.

There also appears to be an error in the percent organic matter in the samples submitted by Co-op Mining Company and coded WHRS. Results show all 14 samples having about 13 to 17 percent organic matter, which is unreasonably high.

3.4 SOIL SUITABILITY AND SALVAGE EVALUATION

Estimates of the amount of suitability soil material that could be salvaged for use in reclamation for each soil map unit based on the Utah Division of Oil, Gas, and Mining guidelines (Appendix A) are shown below:

SOIL MAP UNIT	SALVAGEABLE LAYER (INCHES		RESTRICTED BY
	Approximate Range	Averages	
A	8 to 15	12	Bedrock, stones
B	10 to 30	15	Stones
C	0 to 20	10	Bedrock, Boulder, Stones
D	30 to 60	40	Bedrock, Stones
E	20 to 40	30	Stones
F	0 to 30	10	Rock, Poor Soil, Chemical Properties
G	6 to 30	15	Bedrock, Stones, Boulders

The soils in the project area are extremely complex making it difficult to identify uniform soil layer to salvage. Approximate ranges and averages are given, but actual field operations will be dictated by practical judgement.

REFERENCES

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Jensen, Earl H. and James W. Borchert, 1988. Soil Survey of Carbon Area, Utah. USDA Soil Conservation Service.

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Soil Survey Staff, Soil Conservation Service, 1993. National Soil Survey Handbook, Title 430-VI. Washington, D.C., US Government Printing Office.

Leatherwood, James and Dan Duce, 1986. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining. Salt Lake City, Utah.

Sasser, Leland, 1996. Soil Survey of the Bear Canyon Mine Area, Utah. USDA, Natural Resource Conservation Service.

Stokes, William L., 1986. Geology of Utah. Utah Museum of Natural History, University of Utah and Utah Geological and Mineral Survey, Department of Natural Resources. Occasional Paper Number 6 of the Utah Museum of Natural History. Salt Lake City, Utah.

APPENDIX A

SOIL SUITABILITY CRITERIA

Soil Suitability Criteria

UDOGM: Overburden Evaluation for Vegetative Root Zone; Table 2 (Leatherwood and Duce 1988)

Parameters	Good	Fair	Poor	Unacceptable
pH	6.1 - 8.2	5.1 - 6.1 8.2 - 8.4	4.5 - 5.0 8.5 - 9.0	less than 4.5 greater than 9.0
Ec mmhos/cm 25°C	0 - 2	2 - 8	8 -15	greater than 15
Saturation %	25% - 80%		less than 25% greater than 80%	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
SAR	0 - 4	5 - 10	10 - 12 Fine Texture 10 - 15 Coarse Texture	12 Fine Texture 15 Coarse Texture
Selenium	less than 0.1 mg/Kg			greater than 0.1 mg/Kg
Boron	less than 5.0 mg/Kg			greater than 5.0 mg/Kg
Acid/Base Potential	greater than -5 tons $CaCO_3$ 1,000 tons material			less than -5 tons $CaCO_3$ 1,000 tons material
% Coal fines	Undetermined at this time			
Available water capacity (in/in)	greater than 0.10	0.05 - 0.10	less than 0.05	
Rock Fragments (% volumes)				
3 inches	0 - 15	15 - 25	25 - 30	greater than 30
3 - 10 inches	0 - 15	15 - 25	25 - 30	greater than 30
10 inches	0 - 3	3 - 7	7 - 10	greater than 10

APPENDIX B

SOIL LABORATORY TESTING RESULTS

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT

SOIL SAMPLE I. D. EXPLANATION

WHRS-1 is a site in Pinion-Juniper in Soil Map Unit A. It corresponds to soil profile description CW-6. (Pathead)

WHRS-2 is near some large ponderosa pines in Soil Map Unit D. It corresponds to soil profile description CW-5. (Doney, deep)

WHRS-3 is along the drainage in Soil Map Unit C. It corresponds to soil profile description CW-4. (Winetti)

WHRS-4 is on the north-facing slope near the portal site in Soil Map Unit E. It is near soil profile description CW-1.

CW3-1 is a Doney soil in Soil Map Unit G. It is identified in soil profile description CW-3.

CW5-1 and CW5-2 are from the same site as WHRS-2. These two samples were at greater depths than previously sampled. The site is identified by soil profile description CW-5.

CW8-1 and CW8-2 are from a shallow soil over shale (Cabba) in Soil Map Unit A.

CW9-1 is mixed soil from side cast material along the road in Soil Map Unit E.

CW10-1 was taken on a road cut in Soil Map Unit F. The soil layer appeared to be a light colored calcic horizon in a Guben soil.

Intermountain Laboratories, Inc.
2506 West Main Street
Farmington, NM 87401
ATTN: Eric Jaquez, Soil Laboratory Supervisor

April 9, 1999

Dear Mr. Jaquez:

We are sending seven soil samples for testing as noted on the enclosed record form. These soil samples were taken from an area proposed for coal mine portal development by C.W. Mining Company at the Bear Canyon Mine near Huntington, Utah. EIS is conducting a detailed soil survey and assessment for the project.

We request that the billing be made to: C.W. Mining Company; P.O. Box 1245 Huntington, Utah 84528. Estimated charges are $130 to $160 per sample, depending on the need to determine ESP. If you have any questions or comments, please contact Dan Larsen, Soil Scientist for EIS at (435) 472-3814. Thank you for your services.

Sincerely,

Melvin A. Coonrod
Owner, EIS Environmental Industrial Service

cc: Charles Reynolds, P.E.
C.W. Mining Company
P.O. Box 1245
Huntington, Utah 84528

Inter- Mountain Laboratories, Inc.

CHAIN OF CUSTODY RECORD

Client/Project Name: ES / C.W. Mining Co.

Project Location: Emery Co., Utah — Bear Canyon Mine - Wildhorse Portal

Sampler (Signature): [signature]

Chain of Custody Tape No.:

ANALYSES / PARAMETERS

Sample No./ Identification	Date	Depth (Inches) ~~Time~~	Lab Number	Matrix	No. of Containers					Remarks
CW 3-1	4/8/99	0-30		Soil Testing						ANALYZE FOR:
CW 5-1	4/8/99	36-50								pH, EC, SaT%
CW 5-2	4/8/99	50-70								Ca, Mg, Na, SAR,
CW 8-1	4/8/99	0-6								MA (S, si, c, vfs)
CW 8-2	4/8/99	6-12								CaCO3%, Boron,
CW 9-1	4/8/99	5-30								Se (AB-DTPA), TOC,
CW 10-1	4/8/99	20-30								%OM, ESP (if SAR
										>15 for sandy soils or
										>12 for clays), 1/3 bar
										and 15 bar water%

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[signature]	4/8/99	1200			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by laboratory: (Signature)	Date	Time
			Eric Sagne	4/12	

Inter-Mountain Laboratories, Inc.

- ☐ 1633 Terra Avenue, Sheridan, Wyoming 82801, Telephone (307) 672-8945
- ☐ 1701 Phillips Circle, Gillette, Wyoming 82718, Telephone (307) 682-8945
- ☒ 2506 West Main Street, Farmington, NM 8740[illegible], Telephone (505) 326[illegible]
- ☐ 1160 Research Drive, Bozeman, Montana 59718, Telephone (406) 586-8450
- ☐ 11183 State Hwy. 30, College Station, TX 77845, Telephone (409) 776-8945

54388

iml

Inter-Mountain Laboratories, Inc.

e (505) 326-4737 Fax (505) 325-4182

2506 West Main Street, Farmington, NM 87401

May 5, 1999

Mr. Dan Larsen
ENVIRONMENTAL INDUSTRIAL SERVICES
31 North Main Street
Helper, Utah 84526

Dear Mr. Larsen:

Enclosed are the results of the analyses performed on the soil samples received by IML on April 13, 1999. The samples were labeled Bear Canyon Mine – Wildhorse Portal, and correspond to IML lab numbers 0399S01926 - 32. The requested analyses for each were pH, electrical conductivity, saturation percentage, sodium absorption ratio, mechanical analysis (including analysis of very fine sand), % calcium carbonate, soluble boron, selenium (AB-DTPA), total organic carbon, % organic matter, 1/3 bar water, 15 bar water, and exchangeable sodium percentage for sample with an SAR >15 for sandy soils or >12 for clays.

If you have any questions or comments, please feel free to contact me at 1-800-828-1409.

Sincerely,

Eric J Jaquez
Soil Lab Supervisor
IML - Farmington, NM

enclosure: analytical report

Inter-Mountain Laboratories, Inc.

2506 West Main Street | Farmington, New Mexico 87401 | Tel. (505) 326-4737

Environmental Industrial Services (EIS)

Client Project ID: Bear Canyon Mine | Helper, UT | IML Project #0399S01926

Date Received: 04/13/99 | Bear Canyon Mine - Wildhorse Portal | Report Date: 05/05/99

Lab Id	Sample Id	Depths	pH	EC	Saturation	Ca	Mg	Na	SAR	Sand	Silt	Clay	Texture USDA	Very Fine Sand
		inch	s.u.	mmhos/cm	%	meq/L	meq/L	meq/L		%	%	%		%
0399S01926	CW 3-1	0 - 30	7.8	0.64	35	2.8	4.1	1.2	0.7	53	31	16	SL	15
0399S01927	CW 5-1	36 - 50	7.6	0.37	32	2.4	1.6	0.43	0.3	53	35	12	SL	26
0399S01928	CW 5-2	50 - 70	7.8	0.40	30	1.9	2.7	0.63	0.4	51	37	12	L	25
0399S01929	CW 8-1	0 - 6	7.5	0.37	42	3.2	0.84	0.51	0.4	25	51	24	SIL	17
0399S01930	CW 8-2	6 - 12	7.6	0.33	48	2.2	1.0	0.44	0.3	21	55	24	SIL	16
0399S01931	CW 9-1	5 - 30	7.4	0.63	37	5.3	2.7	0.80	0.4	61	25	14	SL	14
0399S01932	CW 10-1	20 - 30	8.3	10.2	38	7.5	160	35	3.7	43	35	22	L	17

Inter-Mountain Laboratories, Inc.

2506 West Main Street | Farmington, New Mexico 87401 | Tel. (505) 326-4737

Environmental Industrial Services (EIS)

Helper, UT

Bear Canyon Mine - Wildhorse Portal

Client Project ID: Bear Canyon Mine

Date Received: 04/13/99

IML Project #0399S01926

Report Date: 05/05/99

Lab Id	Sample Id	Depths Inch	Boron Soluble mg/Kg	Selenium AB_DTPA mg/Kg	CaCO3 %	TOC %	Organic Matter %	1/3 Bar Water %	15 Bar Water %
0399S01926	CW 3-1	0 - 30	1.6	<0.02	15.9	0.95	1.6	16	9
0399S01927	CW 5-1	36 - 50	0.5	<0.02	18.0	0.46	0.79	12	6
0399S01928	CW 5-2	50 - 70	0.6	<0.02	19.2	0.32	0.55	13	6
0399S01929	CW 8-1	0 - 6	0.9	<0.02	19.6	0.76	1.3	16	10
0399S01930	CW 8-2	6 - 12	0.6	<0.02	17.6	0.54	0.93	17	11
0399S01931	CW 9-1	5 - 30	1.0	<0.02	26.4	1.5	2.6	18	8
0399S01932	CW 10-1	20 - 30	2.5	0.26	28.3	0.64	1.1	18	7

Inter-Mountain Laboratories, Inc.

2506 West Main Street Farmington, New Mexico 87401 Tel. (505) 326-4737

Environmental Industrial Services (EIS)

Client Project ID: Bear Canyon Mine

Helper, UT

IML Project #0399S01926

Date Received: 04/13/99

Bear Canyon Mine - Wildhorse Portal

Report Date: 05/05/99

Lab Id	Sample Id	Depths	pH	EC	Saturation	Ca	Mg	Na	SAR	Sand	Silt	Clay	Texture USDA	Very Fine Sand
		Inch	s.u.	mmhos/cm	%	meq/L	meq/L	meq/L		%	%	%		%
0399S01931	CW 9-1	5 - 30	7.4	0.63	37	5.3	2.7	0.80	0.4	61	25	14	SL	14
0399S01931D	CW 9-1	5 - 30	7.4	0.64	37	5.2	2.7	0.78	0.4	61	25	14	SL	14

Inter-Mountain Laboratories, Inc.

2506 West Main Street | Farmington, New Mexico 87401 | Tel. (505) 326-4737

Environmental Industrial Services (EIS)

Helper, UT

Bear Canyon Mine - Wildhorse Portal

Client Project ID: Bear Canyon Mine

Date Received: 04/13/99

IML Project #0399S01926

Report Date: 05/05/99

Lab Id	Sample Id	Depths	Boron Soluble	Selenium AB_DTPA	CaCO3	TOC	Organic Matter	1/3 Bar Water	15 Bar Water
		Inch	mg/Kg	mg/Kg	%	%	%	%	%
0399S01931	CW 9-1	5 - 30	1.0	<0.02	26.4	1.5	2.6	18	8
0399S01931D	CW 9-1	5 - 30	1.0	<0.02	25.8	1.6	2.7	17	8

B.C.
8A-18
5/31/98

Inter-Mountain Laboratories, Inc.
2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CO-OP MINING COMPANY
Huntington, UT
MINE: Bear Canyon
LOCATION: Bear Canyon Mine

DATE SAMPLED: August 24, 1996
DATE REPORTED: November 4, 1996

Lab No.	Location	Depths Inches	pH	EC mmhos/cm @ 25°C	Saturation %	Calcium mg/l	Magnesium mg/l	Sodium mg/l	SAR	Coarse Fragments %	Sand %	Silt %	Clay %	Texture
49139	WHRS-1	0.0-6.0	7.0	0.88	45.7	3.13	1.18	0.35	0.15	20.6	50.0	27.0	23.0	SANDY CLAY LOAM
49140		6.0-12.0	7.1	0.75	42.5	3.32	1.67	0.42	0.21	33.3	42.0	33.0	25.0	LOAM
49141		12.0-24.0	7.1	0.69	34.7	5.30	1.65	0.46	0.22	35.9	46.0	29.0	25.0	LOAM
49142	WHRS-2	0.0-6.0	6.9	0.72	33.6	3.80	1.53	0.30	0.15	18.2	49.0	38.0	13.0	LOAM
49143		6.0-12.0	7.0	1.07	37.4	9.31	2.59	0.38	0.15	21.4	46.0	39.0	15.0	LOAM
49144		12.0-24.0	7.2	0.79	31.4	6.37	2.25	0.41	0.20	34.3	50.0	33.0	17.0	LOAM
49145		24.0-36.0	7.2	0.53	30.9	3.72	1.67	0.38	0.23	33.6	46.0	39.0	15.0	LOAM
49146	WHRS-3	0.0-6.0	6.7	1.13	34.9	9.97	3.04	0.45	0.18	68.5	64.0	21.0	15.0	SANDY LOAM
49148		6.0-12.0	7.3	0.62	34.0	4.33	2.24	0.39	0.21	52.3	56.0	25.0	19.0	SANDY LOAM
49149		12.0-24.0	7.3	1.14	49.0	8.08	6.74	0.55	0.20	17.9	52.0	29.0	19.0	SANDY LOAM
49150		24.0-36.0	7.2	1.26	44.6	9.59	7.93	0.86	0.29	8.0	54.0	25.0	21.0	SANDY CLAY LOAM
49151	WHRS-4	0.0-6.0	7.2	0.65	34.3	5.20	2.39	0.32	0.16	85.2	54.0	27.0	19.0	SANDY LOAM
49152		6.0-12.0	6.7	1.31	35.4	11.5	4.41	0.53	0.19	56.5	66.0	19.0	15.0	SANDY LOAM
49153		12.0-24.0	7.5	0.63	30.7	3.88	3.31	0.58	0.31	48.6	55.0	26.0	19.0	SANDY LOAM

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage, Exch= Exchangeable, Avail= Available

B.C.
8A-19
5/31/98

Inter-Mountain Laboratories, Inc.

2506 West Main Street

Farmington, New Mexico 87401

Tel. (505) 326-4737

CO-OP MINING COMPANY
Huntington, UT
MINE: Bear Canyon
LOCATION: Bear Canyon Mine

[illegible] August 29, 1996
DATE RECEIVED: November 4, 1996

Lab No.	Location	Depths inches	Organic Matter %	Total Sulfur %	T.S. AB t/1000t	Neut. Pot. [illegible]	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	PyrS AB t/1000t	PyrS AB? t/1000t
49139	WHRS-1	0.0-6.0	15.0	-0.01	0.05	151.					
49140		6.0-12.0	15.0	-0.01	0.05	174.					
49141		12.0-24.0	14.0	-0.01	0.05	190.					
49142	WHRS-2	0.0-6.0	14.3	-0.01	0.07	196.					
49143		6.0-12.0	13.5	-0.01	0.07	114.					
49144		12.0-24.0	17.0	0.01	0.46	85.7					
49145		24.0-36.0	13.0	-0.01	0.05	77.5					
49146	WHRS-3	0.0-6.0	15.2	0.02	0.54	135.					
49148		6.0-12.0	13.2	-0.01	0.09	125.					
49149		12.0-24.0	15.0	0.02	0.49	58.8					
49150		24.0-36.0	15.0	0.02	0.49	47.5					
49151	WHRS-4	0.0-6.0	13.2	-0.01	0.03	113.					
49152		6.0-12.0	15.0	-0.01	0.04	127.					
49153		12.0-24.0	13.7	-0.01	0.08	125.					

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neut. Pot.= Neutralization Potential

B.C.
8A-20
5/31/98

Inter-Mountain Laboratories, Inc.
2506 West Main Street
Farmington, New Mexico 87401
Tel. (505) 326-4737

CO-OP MINING COMPANY
Huntington, UT
MINE: Bear Canyon
LOCATION: Bear Canyon Mine

DATE SAMPLED: August 21, 1996
DATE REPORTED: November 4, 1996

Lab No.	Location	Depths inches	Nitrate-Nitrogen ppm	Boron ppm	Bulk Density	Total Kjeldahl Nitrogen	1/3 bar	15 bar	H2O Sol Selenium ppm
49139	WHRS-1	0.0-6.0	<0.01	0.42	1.77	0.19	23.4	14.0	<0.02
49140		6.0-12.0	<0.01	0.32	2.16	0.14	22.4	12.0	<0.02
49141		12.0-24.0	<0.01	0.27	2.23	0.11	20.0	7.4	<0.02
49142	WHRS-2	0.0-6.0	<0.01	0.25	1.76	0.16	16.4	5.2	<0.02
49143		6.0-12.0	<0.01	0.34	1.50	0.18	13.0	7.0	<0.02
49144		12.0-24.0	<0.01	0.19	2.10	0.08	17.0	5.0	<0.02
49145		24.0-36.0	<0.01	0.23	1.50	0.09	19.0	5.0	<0.02
49146	WHRS-3	0.0-6.0	<0.01	0.51	2.00	0.14	16.0	8.0	<0.02
49147		6.0-12.0	<0.01	0.29	2.20	0.10	19.1	7.2	<0.02
49149		12.0-24.0	<0.01	0.65	1.40	0.22	27.0	14.4	<0.02
49150		24.0-36.0	<0.01	0.63	1.30	0.25	24.4	12.4	<0.02
49151	WHRS-4	0.0-6.0	<0.01	0.39	1.80	0.09	17.5	8.5	<0.02
49152		6.0-12.0	<0.01	0.49	1.70	0.12	19.0	8.8	<0.02
49153		12.0-24.0	<0.01	0.41	2.50	0.07	20.7	6.4	<0.02

Abbreviations for extractants: SP= Saturated Paste Extract, H2OSol= water soluble, ABDTA= Ammonium Bicarbonate-DPTA, AAO= Acid Ammonium Oxalate

APPENDIX C

FIELD SOIL PROFILE DESCRIPTIONS AND TRANSECT DATA

SOIL PROFILE DESCRIPTIONS FOOTNOTES

[1] Soil Series, and Soil Classification according to current NRCS information. Soil classification based on Keys to Soil Taxonomy, 7th edition (Soil Survey Staff 1996).

[2] Horizon and Depth based on site-specific conditions at the sample location.

[3] Texture and texture modifier abbreviations:

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

[4] Color, Dry and Moist: Munsell Soil Color Chart, 1994 Edition.

[5] Structure:

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

[6] Consistency:

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

[7] Roots:

Number	Type	
Very Few	VF	Very Fine
Few	F	Fine
Com (Common)	M	Medium
Many	CO	Coarse

Roots are described in terms of a specified size (type) and quantity (number). The size classes are:

Very Fine: Less than 1 mm in diameter
Fine: 1 to 2 mm in diameter
Medium: 2 to 5 mm in diameter
Coarse: 5 mm or larger in diameter
Roots larger than 10 mm in diameter may be described separately.

Quantity classes or roots are defined in terms of numbers of each size per unit area–1 square centimeter for very fine and fine roots, and 1 square decimeter for medium and coarse roots. All roots smaller than 10 mm in diameter are described in terms of the following quantity classes:

Few: Less than 1 per unit area of the specified size
Common: 1 to 5 per unit area of the specified size
Many: More than 5 per unit area of the specified size
Roots are described as to number first, and type second.

[8] Rock Fragments: All rock fragment percentages (% by volume) are taken from the field soil profile descriptions. Geologic modifier types (gravelly, channery, etc.) are also taken from the field soil profile description forms for each sampled profile.

[9] Reaction:

Effervescence	
EO	Non-Effervescent
SE	Slightly Effervescent
EM	Moderately Effervescent
ES	Strongly Effervescent
EV	Violently Effervescent

Reaction		pH
Str. Acid	Strongly Acid	5.1 - 5.5
Mod. Acid	Moderately Acid	5.6 - 6.0
Sl. Acid	Slightly Acid	6.1 - 6.5
Neutral	Neutral	6.6 - 7.3
Mild. Alk.	Mildly Alkaline	7.4 - 7.8
Mod. Alk.	Moderately Alkaline	7.9 - 8.4
Strong Alk.	Strongly Alkaline	8.5 - 9.0
Very Strong Alk.	Very Strongly Alkaline	>9.0

[10] Horizon Boundaries:

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

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

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Disturbed site, slope side cast over Guben-like soil — File No. CW-1

Area Co-op Mine, Wildhorse Ridge Portal Proj. S24, T16S, R7E Emery Co., UT — Date 4-1-99 D. Larsen C. East — Stop No. 1

Classification Loamy-skeletal, mixed, frigid Typic Ustorthent (disturbed soil)

Location Near portal site, fill slope (side cast) below road clearing, east side of canyon

N. veg. (or crop) Douglas-fir, curleaf mountain mahogany — Climate Ustic, frigid

Parent material Sandstone and shale

Physiography Steep canyon slope

Relief V. steep, single slope — Drainage Well drained — Salt or alkali

Elevation 7660 feet — Gr. water — Stoniness V. stony

Slope 90% — Moisture Profile moist throughout

Aspect NW — Root distrib. Well distributed — % Clay * 25

Erosion Slight — % Coarse fragments * 40 - 50 — % Coarser than V.F.S. *

Permeability Mod.

Additional notes

Site of Co-op Mine soil sampling of 8/21/96
WHRS-1 Lab. No. 49139, 49140, 49141
0-6 6-12 12-24"
Extremely bouldery at toe of slope below
Fill material over an 1-sk Calciborall
like Guben or a Calcic Ustochrept

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		10
Cobble 3-10"		20
Stone 10-24"		20
Boulder >24"		17
Vegetation Good grass recovery		8
Litter		20
Bare		5

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	pH Reaction	Boundary	% Rock Fragments	Root Distribution		
AC1	0-6		10YR 4/3	STV SCL-L	WFGR	SO	FR	SS/SP	es	GW	25G 10C 10S	m-cfm		
AC2	6-31		10YR 4/3	L	WFGR	SO	FR	SS/SP	es	GW	20G 10C 10S	cfm		
2AO	31-35	Highly organic, Mixed soil and woody material	10YR 4/4	L	WFGR	SO	FR	SS/SP	es	CW	"	cfm	Appears to be original surface	
2BK	35-45+	10YR 6/3-7/3	10YR 5/3	L	OM-WFGR	SH	FI	SS/SP	ev		"	ffm		

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Pathead

File No. CW-2

Area Co-op Mine, Wildhorse Ridge Portal Proj. Emery Co., UT | Date 4/1/99 D. LARSON C. EAST | Stop No. 2

Classification Loamy-skeletal, mixed, frigid Typic Ustorthent

Location Near portal site on S. facing slope S24, T16S, R7E

N. veg. (or crop) Pinyon-juniper, service berry, Salina wildrye | Climate Frigid, Ustic

Parent material Sandstone and shale + colluvium

Physiography Canyon side slope, near toe

Relief V. steep, simple | Drainage Well drained | Salt or alkali —

Elevation 7640 | Gr. water — | Stoniness V. stony

Slope 60↑ 75↓ ≈ 65% | Moisture Profile moist throughout

Aspect SSE | Root distrib. Well distributed | % Clay * 20

Erosion Mod. to severe, soil creep | % Coarse fragments * 50 | % Coarser than V.F.S. * -

Permeability Mod.

Additional notes

The upper 24" is primarily soil from sandstone colluvium. At 24 inches to 36 inches is a shaly zone. 36" may be bedrock or a large stone. Bedrock surfaces about 20 feet down slope and at about 50 feet up slope. Lithic soils cover about 5 to 10 percent of the unit.

Mod. Deep

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		10
Cobble 3-10"		20
Stone 10-24"		25
Boulder >24"		15
Vegetation		5
Litter		5
Bare		20

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	pH Reaction	Boundary	% Rock Fragments	Root Distribution		
A1	0-4	10YR 6/2	10YR 4/2	Loam	WFGR	LO-SO	VFR	SS SP	≈8.0 ES	CW	30G 15C 15S	MF		
BW1	4-12	7.5YR 6/4	7.5YR 4/4 *	Loam	WFGR	SO	VFR	SS SP	8.0 ES	GW	25G 10C 15S	CFM		
BW2	12-24		10YR 4/2-4/3	Loam	WMSBK	SH	FR	SS SP	8.0 ES	CW	25G 10C 15S	CFM		
2C	24-36		10YR 4/1	CL	WFSBK + MTNPL	SH	FI	S P	8.0 ES		15G 10C	CF FM		
R	36+	Sandstone												

* The slightly redder color appears to be related to parent material rather than pedogenic

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Doney ? SS or shale bedrock — File No. CW-3

Area CO-OP Mine, Wildhorse Canyon Portal Proj. S24, T16S, R7E Emery Co., UT — Date 4/1/99 D. LAASEN C. EAST — Stop No. 3

Classification Fine-loamy, mixed, frigid, Typic Ustochrept

Location just above first road crossing below portal ≈ 400' below portal N 393,400 E 2,117,300

N. veg. (or crop) Grass (S. wildrye), P-J (few), D-fir (few) — Climate Frigid, Ustic

Parent material Colluvium from sandstone and shale

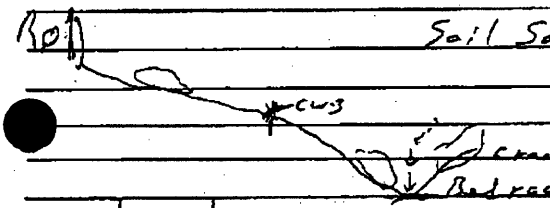
Physiography Toe slope of canyon, slight bench

Relief Steep	Drainage Well	Salt or alkali —
Elevation 7420	Gr. water —	Stoniness Very stony & Bouldery
Slope 45 - 70 ↓	Moisture Profile moist throughout	
Aspect E	Root distrib. Well distributed	% Clay * ≥ 20
Erosion med.	% Coarse fragments * 12 - 40 Ave < 35 in profile	% Coarser than V.F.S. *

Permeability Mod.

Additional notes Shale is exposed in the road cut just below this site in a similar slope position, sandstone rock outcrop above. AC has mixed sandstone and shale fragments.

GROUND COVER (%)	RANGE	AVERAGE ≥
Gravel 2MM-3"		15
Cobble 3-10"		5
Stone 10-24"		20
Boulder >24"		15
Vegetation		15
Litter		20
Bare		10



* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	pH Reaction	Boundary	% Rock Fragments	Root Distribution		
A1	0-3	10YR 5/2	10YR 3/2	Loam	MWFGR	SO	VFR	SS SP	≥8.0 ES	CW	15G 5C 5S	MFM		
A2	3-13	10YR 5/3	10YR 4/2	Loam	WMGR	SO	FR	SS SP	ES	gw	5G 2C 5S	MFM		
A3	13-31	10YR 5/3	10YR 4/2	L-CL	WFSBK	SH	FR	S P	ES	CW	5G 2C 5S	MFM		
AC	31-34		10YR 4/3 70% 10YR 5/2 30%	CL	WFSBK	SH	FI	S P	ES		5G 5C 30S	CFM		
R	34+	? Bedrock or boulder			shale is nearby									

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

SOIL DESCRIPTION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Soil type Winetti, High elev. | File No. CW-4

Area Co-op Mine, Wildhorse Ridge Portal Proj. Emery Co., UT | Date 4/1/99 D. LARSEN C. EAST | Stop No. 4

Classification Loamy-skeletal, mixed, Frigid, Typic Ustifluvent

Location Along Drainage 300 feet below portal site S24, T16S, R7E

N. veg. (or crop) Douglas-Fir | Climate Frigid, Ustic

Parent material Alluvium from sandstone & shale, fan colluvial & fans Close to Cryic in

Physiography Small "Flat" alluvial bottom in narrow canyon The cool bottom position

Relief Gently sloping	Drainage	Salt or alkali
Elevation 7480	Gr. water	Stoniness
Slope 2/0	Moisture	
Aspect West	Root distrib.	% Clay * 20
Erosion In flood plain	% Coarse fragments *	% Coarser than V.F.S. *

Permeability Mod.

Additional notes

Sample site WHAS-3 for Co-op mine Taken 8/21/96 Ref. Tests 49146, 49148, 49149, 49150

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		15
Cobble 3-10"		15
Stone 10-24"		15
Boulder >24"		10
Vegetation		10
Litter		30
Bare		5

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	pH Reaction	Boundary	% Rock Fragments	Root Distribution		
A1	0-2	Frozen to about 15"	10YR 3/2	SL	WFGR	–	FR	SS* SP	7.0	CW	25G 10C 15S	CF		
AC1	2-8		10YR 4/3 – 10YR 4/6	SL	WMGR	–	FR	SS SP	7.2	gw	25G 10C 15S	CFM		
AC2	8-24		10YR 4/4 7.5YR 4/4	SL	WMGR OM	–	FR	SS SP	7.5	gw	30G 15C 8S	CFM		
C	24-36		10YR 4/4 7.5YR 4/4	SL-SCL	OM	SH	FR	SS SP	7.5		35G 15C 10S			

* Very slightly sticky, near 50, Po

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type: Similar to Doney only deeper and very close to coarse-loamy

File No. CW-5

Area: Coop Mine, Wildhorse Ridge Partial Proj. Emery Co, Utah

Date 4/2/99 D. LARSEN C. EAST

Stop No. 5

? Classification: Fine-loamy, mixed (Calcareous) Frigid Typic Ustorthent or Ustic haprent

Location: Proposed T-soil storage site S24, T16S, R7E

N. veg. (or crop): Ponderosa pine, Juniper, (few) sagebrush, Saline wildrye

Climate: Frigid, Ustic

Parent material: Colluvium from Sandstone and shale (or slope wash; local alluvium)

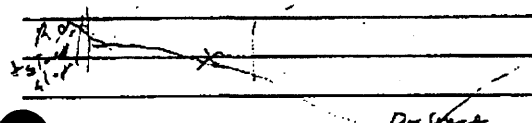
Physiography: Slight bench, Toe slope near canyon bottom

Relief: Mod. steep	Drainage: Well drained	~~Salt or alkali~~
Elevation: 7240	Gr. water: —	Stoniness
Slope: 25-30%	Moisture: Moist throughout profile	
Aspect: South	Root distrib.: Well distributed to 60 inches	% Clay *: 17 AE Fine-loamy and coarse-loamy break
Erosion: moderate	% Coarse fragments *	% Coarser than V.F.S. *

Permeability: Moderate

Lab. No.

Additional notes: Coop Mine Soil Sample site WHRS-2 - C1586 (49142, 49143, 49144, 49145)
Three large ponderosa pine trees 2½-3 feet in diameter on this site.
Several old gullies that are healing



GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		15
Cobble 3-10"		10
Stone 10-24"		5
Boulder >24"		2
Vegetation		6
Litter Pine needles & grass		60
Bare		2

Sampled to a greater depth than previous sampling by Co-op mine, 96
Deepest soil, least stony bench noted in area

* Control section average

Horizon	Depth inches	Color Dry	Color Moist (Munsell, 94)	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Phenol red Reaction	Boundary	% Rock Fragments	Root Distribution		
A	0-6	Grayish Brown 10YR 5/2-4/2	Dark grayish brown 10YR 4/2	FSL-L	WFGR	SO	VFR	SS SP	7.8 ES	GW	5G 5C	MF CM		
AC1	6-20		Brown 10YR 4/3	FSL-L	WFSBK	SO	FR	SS SP	7.8 ES	DW	10G 5C	CFM		
AC2	20-50		Brown 10YR 4/3	FSL	WFSBK	SH	FR	SS SP	8.0 ES	GW	5G 2C	CFM		
C1	50-60		Yellowish Brown To Brown 10YR 5/4 - 4/3	FSL	OM	SH	FR	NS NP	8.0 ES	CW	10G 5C	CFM		
C2	60-73		Yellowish Brown 10YR 5/4	FSL-LFS	OM	SH	VFR	NS NP	8.0 ES		15G 10C	FFM		
	73"	bedrock or large rock fragment												

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

SOIL DESCRIPTION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Soil type Pathead ? - may have a cambic horizon and ∴ ochrept

File No. CW-6

Area Co-op Mine, Wildhorse Bridge Ported Proj. Emery Co., UT | Date 4/2/99 D. LARSEN C. EAST | Stop No. (2) 6

Classification Loamy-skeletal, mixed (calcareous), frigid Typic Ustorthent or Ustochrept

Location Near west end of conveyor corridor, P-J hill, about 300 feet from west end one 6" Fir | S24, T16S, R7E

N. veg. (or crop) Pinyon, Juniper, curleaf mtn. mahogany | Climate Ustic, frigid

Parent material Sandstone and shale, colluvium

Physiography Small lateral ridge, foothill, Descension hill. Top

Relief Convex	Drainage Well drained	Salt or alkali
Elevation 7310	Gr. water —	Stoniness Stony
Slope 15%; slope on sides 60%	Moisture Moist throughout profile	
Aspect South	Root distrib. Restricted at 15 inches	% Clay * 25%
Erosion Mod.	% Coarse fragments * ≈ 40	% Coarser than V.F.S. *

Permeability Mod - Mod. Slow

Additional notes Co-op Mine sample site for WHBS-1, 49139, 49140, 49141
Extremely stony below 20 inches, but this does not appear to be bedrock
Sandstone rock outcrop up slope ≈ 150'
Shale encountered at top of slope

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		20
Cobble 3-10"		15
Stone 10-24"		13
Boulder >24"		5
Vegetation		7
Litter		20
Bare		20

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution		
A1	0-3	10YR 4/2-5/2	10YR 3/2	CL	MFGR	SO	VFR	SP	EV	CW	25G 15C 5S	MVF MF		
BW1	3-10	10YR 6/4	10YR 4/6	SCL	MFSBK	SH	FI	SP	EV	gw	10G 10C 10S	CFM		
BW2	10-15	-	10YR 3/4	L-CL	WFSBK	SH	FR	SP	EV	gw	15G 10C 10S	CFMC		
C1	15-20	-	10YR 4/4 70% 10YR 5/2 30%	L-CL	OM	H	VFI	SP	EV	gw	30G 20C 20S	VFM		
C2	20+	very high in rock fragments and dense, not practical to dig by hand tools									≈ 70 RF.			

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

Soil type Guben

File No. CM-7

Area Co-op Mine, Wildhorse Ridge Portal Proj. Emery Co. UT | Date 4/2/99 D. LARSEN C. EAST | Stop No. 7

Classification Loamy-skeletal, mixed Typic Calciborall

Location Road cut above the portal site S24, T16S, R7E

N. veg. (or crop) Douglas-fir, curleaf mtn. mahogany, pinyon, S. wildrye | Climate Frigid, Ustic

Parent material Colluvium from sandstone and shale

Physiography Canyon sideslope

Relief Very steep | Drainage Well drained | Salt or alkali

Elevation 7400 feet | Gr. water | Stoniness V. stony

Slope 60% | Moisture

Aspect NW | Root distrib. Concentrated in upper 12" Less below, but not restricted | % Clay* 20

Erosion Slight | % Coarse fragments* 45 | % Coarser than V.F.S.*

Permeability Moderate

Additional notes Snow storm, windy ≈ 30°F

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		
Cobble 3-10"		
Stone 10-24"		
Boulder >24"		
Vegetation		
Litter		
Bare		

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution		
A	0-12	Grayish Brown 10YR 5/2	V. Dark grayish brown 10YR 3/2 - 4/2	Loam	MFGR	SO	VFR	SS SP	es	cw	15 G 15 C 15 S	MVF-F		
BK1	12-20	10YR 5/2 - 6/2	Brown 10YR 4/3	Loam	WFSBK	SH	VFR	SS SP	ev	gw	15 G 15 C 15 S	CFM		
BK2	20-40	Light grayish br. To light gray 10YR 6/2 - 7/2	Grayish brown 10YR 5/2 - 5/3	Loam	WFSBK To OM	SH	FR-FI	SS SP	ev	gw	15 G 15 C 15 S	FFM		
BC	40-54		Brown 10YR 4/3	Loam	OM	SH	FI	SS SP	es	gw	15 G 15 C 15 S	FF		
C	54+	V. stony a bouldery colluvium			Bedrock not noted						20 G 20 C 20 S 10 B			

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

SOIL DESCRIPTION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Soil type Cabba

File No. CW-8

Area Wild Horse Ridge Portal Project | Date 4/7/99 D. Iversen | Stop No. 8

Classification Loamy, mixed (calcareous), frigid, shallow Typic Ustorthent

Location Lower end of proposed conveyer, near Topsoil storage site S24, T16S, R7E

N. veg. (or crop) P-Juniper | Climate Ustic / Frigid

Parent material Thin colluvium over shale

Physiography Foothills, Toe slope

Relief steep	Drainage well drained	Salt or alkali
Elevation 7260	Gr. water —	Stoniness
Slope 40%	Moisture Profile is moist	
Aspect NE	Root distrib.	% Clay *
Erosion Mod.	% Coarse fragments *	% Coarser than V.F.S. *

Permeability slow

Additional notes Notes on T1-4
Surface is cobbly but soil is shallow over shale
Sampled for lab. analysis

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		25
Cobble 3-10"		15
Stone 10-24"		5
Boulder >24"		5
Vegetation		5
Litter		15
Bare		30

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution		
A1	0-4		10YR 3/2	L	MFGR	SO	VFR	S/P		cw	15 a	CFM		
AC	4-12		10YR 4/2	CL	WFGR WTPL	SH-SO	FR	S/P		gw	45 b	CFM		
CR	12-18+		2.5Y 4/2-10YR 4/1	weathered gray shale having platy rock structure								FF		

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL TRANSECT DATA SHEET - Notes

Page No. 1

Co-op Mine T1 S24, T16S, R7E

County Emery | Soil Mapping Unit Pathead-Cabba Tentatively MU-A

Transect No. T1 | Direction W To E | Boring Interval 2/100' | Length

Starting Location West end of conveyor corridor

Date 4/2/99 | Photo | By D. Larsen

Remarks

T1-1 & 2 are between profiles CM-6 on top of P-J hill and the present road, T1-3 & 4 are between CM-6 and CM-5

Profile No. T1-1

Percent Slope 60 | Aspect West | Erosion Topsoil stony

Position on Slope Side slope

Horizon	Depth Inches	Color	Texture	Structure	Consistence	~~Mottles~~	Fragments	Clay Films	pH
A1	0-5	10YR 3/2	SL	WFGR		12C, 10C	10S		
AC	5-10	10YR 4/2	SL	WFGR		Surface rock frag. is			
BC	10-28	10YR 5/4	L	OM		high, less in profile			
C	Shaly material mixed with sandstone colluvium								

CM-6

Additional Notes Very Pinyon-Juniper between. Similar To Cabba only med. deep & higher rocks M.d. deep over shale | Series Pathead Fry

Classification L-SK mixed frigid Typic Ustorthent

Profile No. T1-2

Percent Slope 60% | Aspect West | Erosion

Position on Slope Side slope

Horizon	Depth	Color	Texture	Structure	Consistence	~~Mottles~~	Fragments	Clay Films	pH
AC	0-8	10YR 4/2	SL	WFGR		25C, 10C	5S		
C	8-15	10YR 5/4	L	WFGR OM					
C2	very stony								

Additional Notes P-J

Very stony | Series Pathead

Classification Loamy-skeletal mixed frigid Typic Ustorthent

Profile No. T1-3

Percent Slope 60% | Aspect East | Erosion

Position on Slope

Horizon	Depth	Color	Texture	Structure	Consistence	~~Mottles~~	Fragments	Clay Films	pH
A1	0-3	10YR 3/2	SL	MWGR		25C, 10C	5S		
AC	3-15	10YR 4/4	SL	WFGR		20C, 10C	5S		
C	15-20	10YR 5/4	L	OM		Extremely cobbly			

Additional Notes P-J

EST. surface 35C, 20C, 10S

15% litter, 5% veg, 15% Bare soil | Series Pathead

Classification

CM6

T1 2 3

1

PJ

CM-4

CM-5

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL TRANSECT DATA SHEET

T1
Page No. 2

County Emery Co. | Soil Mapping Unit Tentatively A
Transect No. T11 | Direction ~W → E | Boring Interval ~100' | Length
Starting Location West end of conveyor corridor
Date 4/2/99 | Photo | By D. Larsen
Remarks P-J foothills

Profile No. T1-4
Percent Slope 40% | Aspect NE | Erosion
Position on Slope Toeslope, lower 1/3

Horizon	Depth	Color	Texture	Structure	Consistence	~~Mottles~~	Fragments	Clay Films	pH
A1	0-4	10YR 3/2	L	MFGR		15C, 15C,	5S		
AC	4-12	10YR 4/2	CL	WFGR		5C, 5C			
CR	12-18	Weathered grey shale							
		Platy rock structure							

LW-8
Sand hat on 4/9/99

Additional Notes Pinyon-juniper
Shallow over shale
Series Cabba
Classification Loamy, mixed (calcareous), frigid, shallow Typic Ustorthent

Profile No. _____
Percent Slope | Aspect | Erosion
Position on Slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH

Additional Notes
Series
Classification

Profile No. _____
Percent Slope | Aspect | Erosion
Position on Slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH

Additional Notes
Series
Classification

T2

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SOIL TRANSECT DATA SHEET

T2 Page No. 2

Access road

County Emery | Soil Mapping Unit

Transect No. | Direction | Boring Interval | Length

Starting Location

Date 4/7/99 | Photo | By DLC

Remarks

Profile No. T2-4 170 yds from T2-3 | Surface V, stony

Percent Slope 45 | Aspect NW | Erosion

Position on Slope Toeslope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
A1	0-10	10YR 3/2 M	1			15C-15C	10S		
AC	10-20	10YR 4/3	1			20C-15C	10S		
weak BK	20-32	10YR 4/4	1			"			
C						"			
	Rock Ks ~ 10%								

Additional Notes

Photo 8 - up road, boulders on left

Reader conveyor together here | Series Dotino on cut

Classification

Profile No. T2-5 on cut slope | Looks like some washing from road runoff

Percent Slope 45% | Aspect NW | Erosion Some

Position on Slope Toeslope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
A1	0-8	10YR 3/2 4/2	SL	WFGR	NS NP	15 20	15		
AC	8-32	10YR 4/2	SL	WFGR	NS NP	"			
CA	32+	10YR 4/4	SL	OM	NS NP	"			
CW-9 SAMPLED	Composite		5-30" layer						

Additional Notes Some sidecast material on slope from road above

Photos 7 & 6

Near drainage crossing on road before switch back | Series Mixed / Dotino ?

Classification

Profile No. T2-6 ≈ 60% | Aspect W | Erosion

Percent Slope ≈ 10%

Position on Slope Drainage bottom & Toeslope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
Very bouldery drainage bottom									
(Alluvial and colluvial materials									
D-F on N facing slope									
Rock outcrop on South facing slope (P.J.)									
V stony sandy loam									
Similar to T2-5 on Toeslope / road									

Additional Notes Photo 5 - looking up stream, conveyor route and road on right

Photo 4 - P.J. slope & R.O. N side | Series

Classification

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SOIL TRANSECT DATA SHEET

T2
Page No. 3

Access road

County | Soil Mapping Unit

Transect No. | Direction | Boring Interval | Length

Starting Location

Date | Photo | By

Remarks

Profile No. T2-7

Percent Slope 70% | Aspect N | Erosion

Position on Slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
Note	Cut slope has a short section of moderately deep, loamy soil over shale								
	It is most likely very deep colluvium. Visually calcareous								
	Some calcium carbonate but doesn't appear to be enough for a calcic horizon								
	Also some side cast material across the slope								

Additional Notes

Drainage bottom very boulders

Series Dattner

Classification Dancy 30' section

Profile No. T2-8

Percent Slope 65% | Aspect N | Erosion

Position on Slope

Horizon	Depth	Color EST	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
O	1-0								
A1	0-6	10YR 3/2	l	WFGR	SO VFR SS SP	10GR 10C	30S		
A2	6-12	10YR 3/2	l	WFGR	SO VFR SS SP	"			
BK1	12-21	10YR 4/4-5/4	SCL	"	SH FR, SS SP	15G 20C	5S		
BK2	21-32	10YR 5/4	SCL	0M		20G 20C	10S		
BK3	32-45	10YR 5/4	SCL	more angularity		"			

Additional Notes

Large boulder just up slope
Photo 3

Series Cuben

Classification

Profile No. T2-9

Percent Slope 80% | Aspect South east | Erosion

Position on Slope Toe slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
Shallow and moderately deep over shale									
Similar to soil pit CW-3									

Additional Notes

Photo 2 Cut at switch back, at drainage crossing, north side
Sandstone rock outcrop over slide

Series

Classification Dancy
Cabba

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Page No. 4

County: Along access road | Soil Mapping Unit:

Transect No. | Direction | Boring Interval | Length

Starting Location

Date 4/7/99 | Photo | By

Remarks

Profile No. T2-10

Percent Slope 80% | Aspect NW | Erosion Slumpy/split

Position on Slope Lower 1/3

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
About a 70 foot section of slope shows water seepage and shallow slumping (stream failure) CL soils / SS shale similar to Dancy but water 4'+ (mod depth to lime)									
Most of the road cut shows Cuban and Oetna-like soils - Questionable mollic - look: Ochric on about 40% of the soils - Calcic is weak - Some Dotino soils 70%									

Additional Notes About 300' above stream crossing
Est. about 10% max slope within 10' of surface
At NRCS soil unit break - Food investigation

Series

Classification

Profile No. T2-11

Percent Slope 60% | Aspect NW | Erosion

Position on Slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
This section of slope has mostly very deep, well drained erosional stony colluvium									
Surface is mostly too light for a mollic									
No calcic									
Erosional section (40') bedrock is 1-4 ft from the surface									

Additional Notes About 200' from first switchback on North-facing slope
Some bristlecone pines present + Pinyon Fir D.F - moss.

Series

Classification 1-SK. T. Ustorthent, rudeon

Profile No. TR-12

Percent Slope 70% 8°↓ | Aspect NW | Erosion Pinyon; Bristlecone pine D-Fir

Position on Slope Mid-slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
Bedrock and large boulders with pockets of very stony colluvium									

Additional Notes

Series

Classification

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Page No. 5

Along access road

County | Soil Mapping Unit

Transect No. T2 | Direction varies | Boring Interval | Length

Starting Location

Date | Photo | By

Remarks

Profile No. T2-13

Percent Slope 70% | Aspect N | Erosion

Position on Slope Mid slope at edge of slight discection

Horizon	Depth	Color M	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
O	1-0		1						
A	0-2	10YR 4/2	1	WFGR		15G, 10G	10S		
AC	2-8	10YR 4/4	1	WFSBK			5B		
BK or C	8-24	10YR 5/4	1	OM					
	boulders & stones in colluvium					10G, 10C	90S 40B		

Additional Notes Roots limited to about 24'
Photo Taken of road cut; stony, bouldery colluvium over thin coal, shale and sandstone

Series

Classification 1-SK T. Ustochrept ? Ustorthent

Profile No. T2-14

Percent Slope 70 | Aspect NW | Pinyon Juniper Douglas Fir

Position on Slope M. slope

Horizon	Depth	M Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
A1	0-12	10YR 3/2-4/2	SL	2MGR		Mixed GR-B			
AB	12-16	10YR 4/2	1	WSBK		60% RF			
BK+	16-36	10YR 5/3	1	OM	VH, VFI				
C	36+		SL-1	OM	VH, VFI				
	To at least 12'								
+	marginal to calcic								

Additional Notes Near switchback at upper level access to portal

Series Fruita (?) Dathis

Classification 1-SK mixed Typic Calciborolls or Haplocambids

Profile No. T2-15

Percent Slope 60 | Aspect NW | Erosion D. Fir, pinyon, mt. mahogany

Position on Slope M. slope

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
Similar to		T2-14							
CW-10									

Additional Notes 20-30 Sampled for Calcic
CW-10

Series Gubow

Classification Weak Mollic

APPENDIX D

SOIL AND LANDSCAPE PHOTOGRAPHS
WILD HORSE RIDGE PORTAL PROJECT

(Photographs were taken on April 1, 2, and 7, 1999.)
Original photos were 4 X 7 inches. Distortion has occurred in format for page layout on some of the photos.

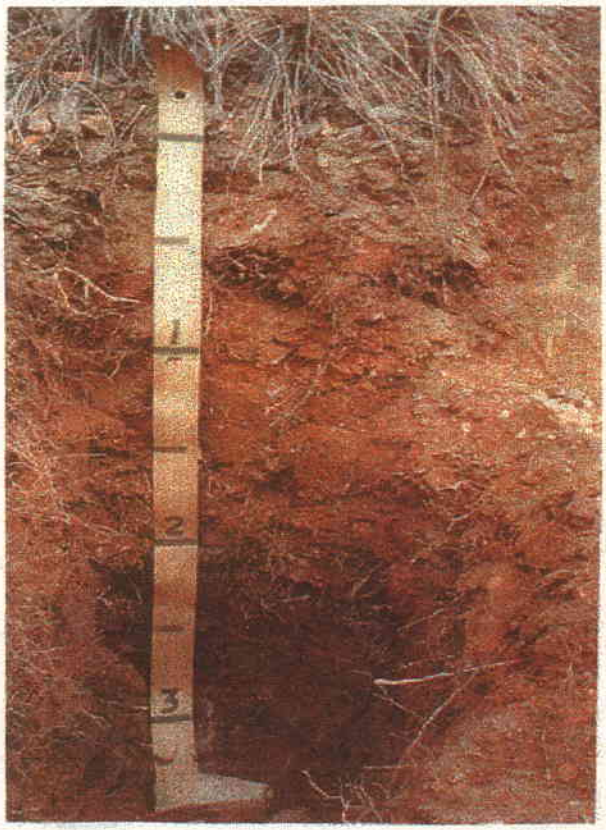
WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE

Soil Profile CW-1 and photo of the slope below the road at the portal site.

Side cast material on a north-facing slope. the original surface is at a depth of about three feet.

Tape measure units are in feet.

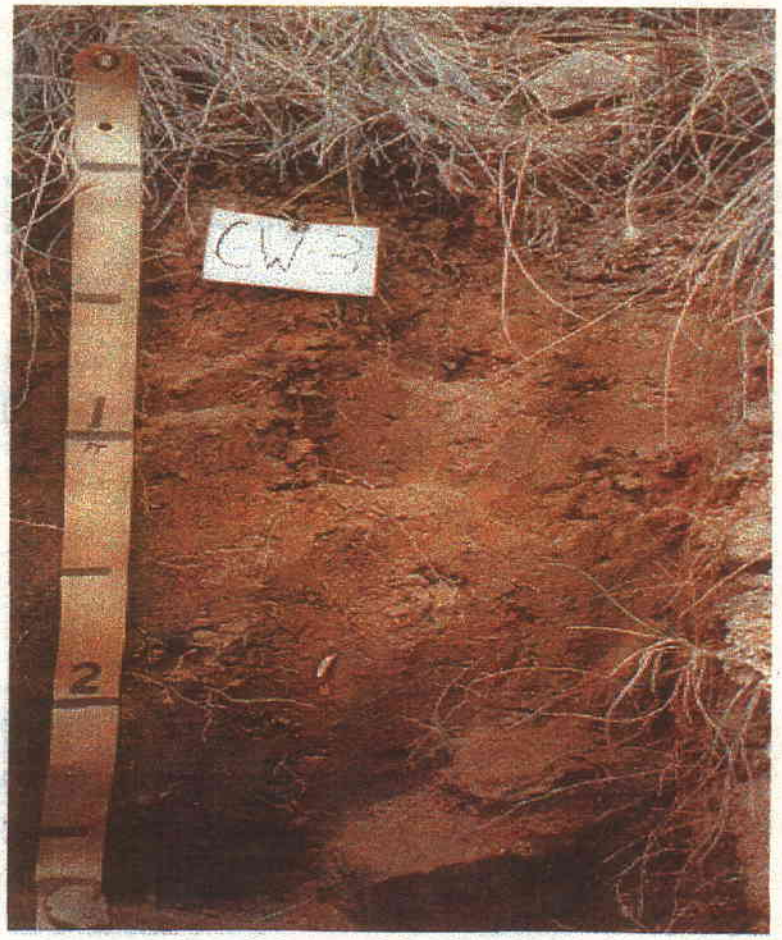
WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE



Soil Profile CW-2 and surface conditions on the south-facing slope near the portal site. A Pathead soil in Soil Map Unit G.

Note sandstone rock crop near top of photo above.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE



Soil Profile CW-3 and surface conditions. Toe of a south-facing slope about 800 feet below the portal site along the conveyor corridor.

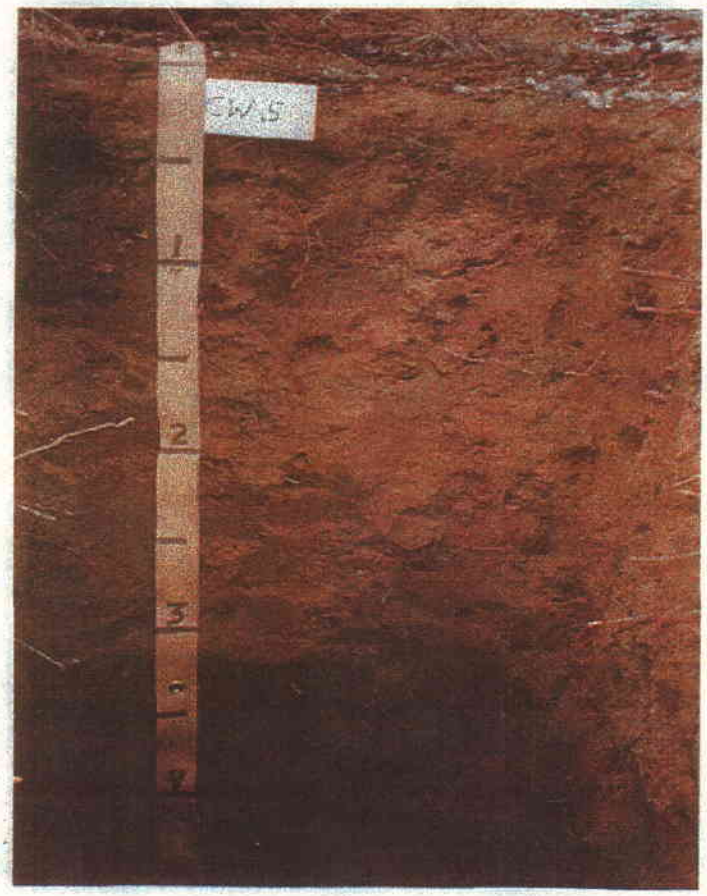
A moderately deep soil (Doney) over shale in Map Unit G.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE

Lower photo shows the site of Soil Profile CW-4 an soil sampling site WHRS-3 in Soil Map Unit C, about 600 feet down the canyon from the portal site.

The upper photo is looking down the drainage from the portal site. The drainage is cut to bedrock.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE



Soil Profile CW-5 in Soil Map Unit D.

Soil Sampling site WHRS-2 by Co-op Mining Company.

Deep soils on a slight bench on a toeslope. This site has been proposed as a topsoil storage area.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE

Soil Profile CW-6 and landscape features along the west end of the conveyor corridor.

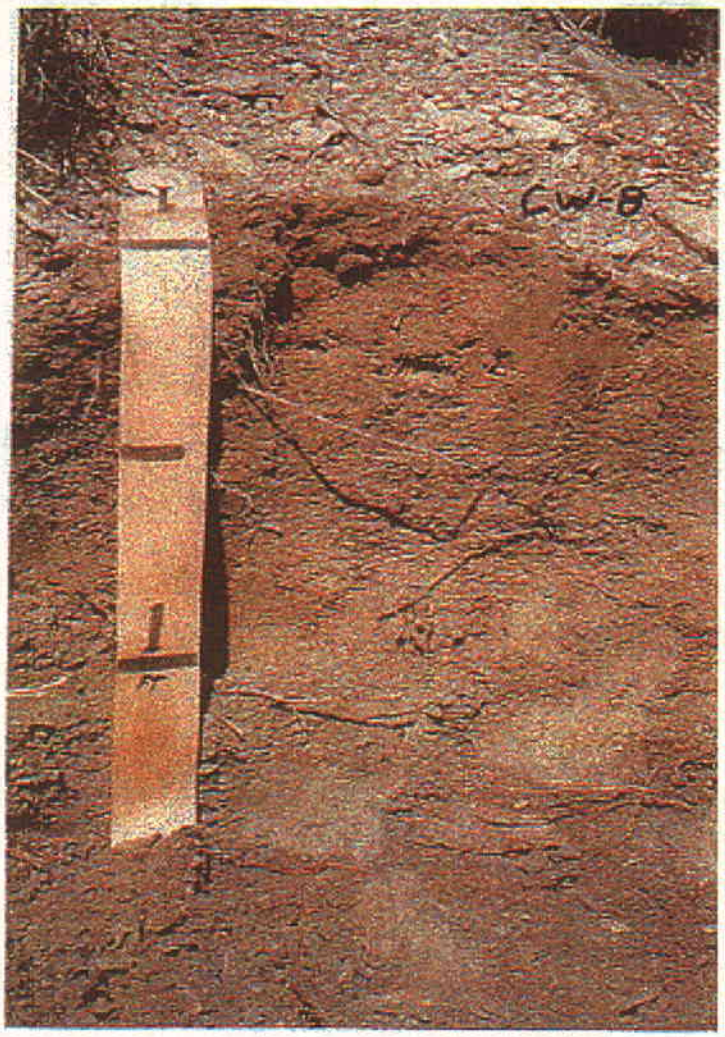
A Pathead soil in Soil Map Unit A.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE

Soil Profile SW-7 site on road cut above the portal location.

A Guben soil in Soil Map Unit E.

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE



Soil Profile CW-8 and surface conditions in Soil Map Unit A.

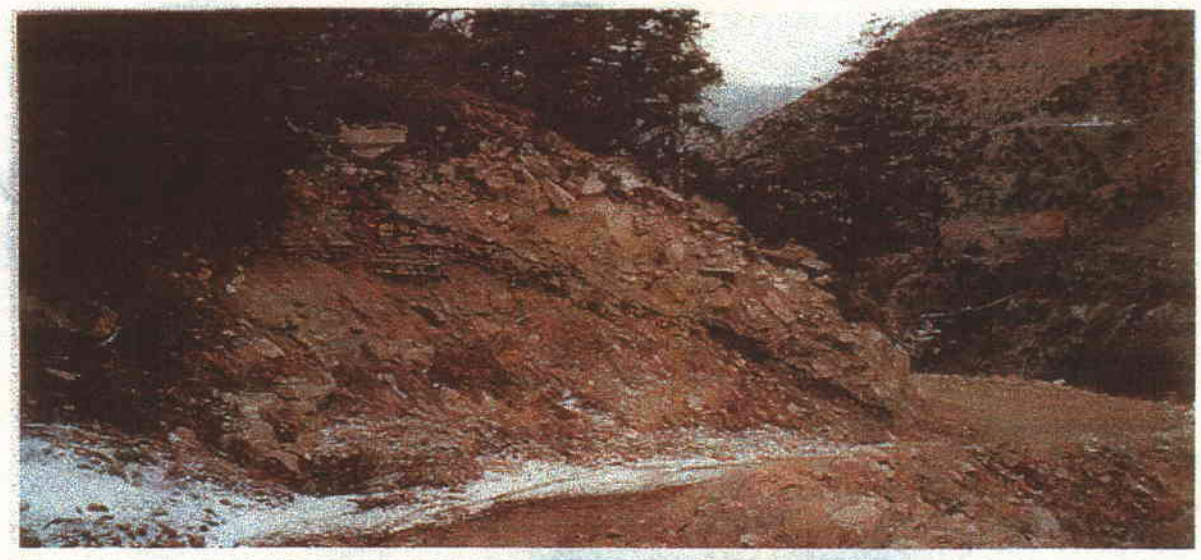
This is a shallow soil over shale (Cabba).

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE

Soil Sampling Site CW-9 at the toe of a north-facing slope in Soil Map Unit E.

Corresponds with transect data sheet T2-5

WILD HORSE RIDGE PORTAL PROJECT
BEAR CANYON MINE



Examples of roadcuts on the north-facing slopes showing very stony colluvium and shale.

Top photo corresponds to transect data point T2-13 and the lower photo is at T2-2 and T2-3

APPENDIX E

SOIL SERIES AND FAMILY DESCRIPTIONS (TAXONOMIC UNITS)

FROM: Soil Survey of Carbon Area, Utah,
USDA, Natural Resources Conservation Service

Cabba Family

The Cabba family consists of shallow, well drained, moderately permeable soils on benches, canyon rims, and steep canyonsides. These soils formed in residuum and colluvium derived dominantly from shale or siltstone of the Green River Formation. Slope is 3 to 70 percent. Elevation is 5,000 to 8,200 feet. Average annual precipitation ranges from 12 to 16 inches, and average annual air temperature ranges from 42 to 45 degrees F.

These soils are loamy, mixed (calcareous), frigid, shallow Typic Ustorthents.

Reference pedon of a Cabba family bouldery loam in an area of Cabba family-Guben-Rock outcrop complex, on the slopes of Cottonwood Ridge, about 250 feet west and 1,500 feet north of the southeast corner of sec. 7, T. 13 S., R. 16 E.

A1—0 to 3 inches; pale brown (10YR 6/3) bouldery loam, brown (10YR 4/3) moist; moderate medium granular structure parting to moderate fine granular; loose, slightly sticky and slightly plastic; common very fine and fine roots; 5 percent pebbles, 10 percent cobbles, and 15 percent boulders; slightly calcareous; disseminated calcium carbonate; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1—3 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; loose, slightly sticky and slightly plastic; common very fine and fine roots; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C2—7 to 15 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly calcareous; moderately alkaline (pH 8.3); abrupt smooth boundary.

C3r—15 inches; rippable shale; soft carbonate coatings on surface of rock.

Paralithic contact is at a depth of 8 to 20 inches.

A horizon: Hue is 10YR or 5Y, and value is 4 or 5 when moist. Texture is gravelly loam, bouldery loam, or extremely channery loam.

C horizon: Hue is 10YR or 2.5Y, value is 5 or 6 when dry, and chroma is 2 to 4. Texture is loam, gravelly loam, or clay loam. Clay content is 20 to 35 percent. Rock fragment content is 0 to 30 percent.

Datino Series

The Datino Series consists of very deep, well drained, moderately permeable soils on canyonsides and mountain slopes. These soils formed in colluvium derived dominantly from sandstone and shale. Slope is 15 to 80 percent. Elevation is 6,800 to 8,700 feet. Average annual precipitation ranges from 16 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Haploborolls.

Typical pedon of a Datino extremely stony fine sandy loam in an area of Perma family-Datino complex, about 0.25 mile south of Soldier Creek Mine, 2,400 feet west and 2,200 feet south of the northeast corner of sec. 18, T. 13 S., R. 12 E.

A1—0 to 10 inches; brown (10YR 4/3) extremely stony fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium and coarse roots; few very fine pores; 15 percent pebbles, 25 percent cobbles, and 25 percent stones; moderately alkaline (pH 7.9); clear smooth boundary.

B2—10 to 16 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine pores and few medium pores; 15 percent pebbles, 15 percent cobbles, and 10 percent stones; slightly calcareous; moderately alkaline (pH 7.9); gradual wavy boundary.

Clca—16 to 41 inches; pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine pores; 15 percent pebbles, 20 percent cobbles, and 25 percent stones; strongly calcareous; soft powdery masses of calcium carbonate; moderately alkaline (pH 8.0); gradual smooth boundary.

C2—41 to 60 inches; pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few very fine pores; 15 percent pebbles, 20 percent cobbles, and 25 percent stones; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 7.9).

Secondary calcium carbonate is at a depth of 15 to 22 inches. The mollic epipedon is 10 to 15 inches thick. The solum is 15 to 22 inches thick. The particle-size control section is 35 to 60 percent rock fragments.

A horizon: Value is 4 or 5 when dry and 2 or 3 when moist, and chroma is 2 or 3.

B2 horizon: Value is 3 to 5 when dry and 2 to 4 when moist, and chroma is 2 or 3. Clay content is 18 to 26 percent. Rock fragment content is 35 to 45 percent. Reaction is mildly alkaline or moderately alkaline.

C horizon: Value is 5 or 6 when dry, and chroma is 2 or 3. Clay content is 16 to 25 percent. Rock fragment content is 40 to 70 percent. Reaction is mildly alkaline or moderately alkaline.

Doney Family

The Doney family consists of moderately deep, well drained, moderately permeable soils on benches, foot slopes, and mountain slopes. These soils formed in residuum and colluvium derived dominantly from siltstone, shale, and sandstone. Slope is 3 to 70 percent. Elevation is 6,700 to 9,500 feet. Average annual precipitation ranges from 14 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are fine-loamy, mixed, frigid Typic Ustochrepts.

Reference pedon of a Doney family stony loam in an area of Rabbitex-Doney family-Midfork family complex, about 7.5 miles northwest of Helper, 800 feet south and 1,800 feet east of the northwest corner of sec. 19, T. 12 S., R. 9 E.

A1—0 to 4 inches; brown (10YR 5/3) stony loam, dark brown (10YR 3/3) moist; weak medium platy structure parting to moderate medium granular; soft, friable; common very fine and fine roots; few very fine pores; 10 percent pebbles, 5 percent cobbles, and 5 percent stones; slightly calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); abrupt smooth boundary.

B21—4 to 11 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and common fine roots; few very fine pores; 5 percent pebbles and 5 percent cobbles; slightly calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); gradual smooth boundary.

B22—11 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine pores; 10 percent pebbles; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); gradual smooth boundary.

C1—15 to 24 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; massive; loose, very friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; 10 percent pebbles; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

C2—24 to 35 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; massive; loose, very friable, slightly sticky; few fine roots; few very fine pores; 15 percent pebbles; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 9.0); gradual smooth boundary.

C3r—35 inches; weathered shale.

Paralithic contact is at a depth of 20 to 40 inches. The particle-size control section is 0 to 15 percent rock fragments.

A1 horizon: Hue is 10YR or 2.5Y, value is 5 or 6 when dry, and chroma is 2 or 3. Texture is gravelly sandy loam, silt loam, and stony loam. Clay content is 15 to 22 percent.

B horizon: Hue is 10YR or 2.5Y, value is 5 to 7 when dry and 4 to 6 when moist, and chroma is 2 or 3. Texture is loam or clay loam. Clay content is 18 to 30 percent.

C horizon: Hue is 10YR or 2.5Y, value is 6 or 7 when dry and 5 or 6 when moist, and chroma is 2 or 3. Texture is loam or clay loam.

Guben Series

The Guben series consists of very deep, well drained, moderately permeable soils on canyonsides and mountain slopes. These soils formed in colluvium derived dominantly from sandstone and shale. Slope is 15 to 75 percent. Elevation is 5,000 to 9,500 feet. Average annual precipitation ranges from 14 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Calciborolls.

Typical pedon of Guben extremely bouldery loam in an area of Cabba family-Guben-Rock outcrop complex, in Prickly Pear Canyon, about 1,200 feet south and 2,000 feet east of the northwest corner of sec. 14, T. 12 S., R. 15 E.

O1—0.5 inch to 0; pine needles and grasses.

A1—0 to 7 inches; grayish brown (10YR 5/2) extremely bouldery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; 15 percent pebbles, 10 percent cobbles, 5 percent stones, and 10 percent boulders; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.2); clear wavy boundary.

B2—7 to 15 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; 10 percent pebbles, 15 percent cobbles, and 20 percent stones; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—15 to 30 inches; very pale brown (10YR 7/3) very stony loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; few very fine and fine pores; 10 percent pebbles, 20 percent cobbles, 20 percent stones, and 5 percent boulders; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); clear smooth boundary.

C2—30 to 60 inches; light yellowish brown (10YR 6/4) very stony loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine and medium pores and common fine pores; 10 percent pebbles, 20 percent cobbles, 25 percent stones, and 5 percent boulders; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 9.0).

The mollic epipedon is 7 to 10 inches thick. The solum is 15 to 24 inches thick. The particle-size control section is 35 to 60 percent rock fragments. Secondary calcium carbonate is at a depth of 11 to 24 inches.

A horizon: Value is 4 or 5 when dry, and chroma is 2 or 3. Texture is extremely bouldery loam, extremely stony loam, or extremely bouldery fine sandy loam. Reaction is mildly alkaline or moderately alkaline. Calcium carbonate equivalent is 11 to 19 percent.

B horizon: Hue is 10YR or 7.5YR, value is 5 or 6 when dry and 3 or 4 when moist, and chroma is 2 to 4. Texture is very stony loam or very cobbly loam. Clay content is 17 to 22 percent. Rock fragment content is 35 to 55 percent. Reaction is mildly alkaline or moderately alkaline. Calcium carbonate equivalent is 20 to 25 percent.

Cca horizon: Hue is 7.5YR or 10YR, value is 6 or 7 when dry and 5 or 6 when moist, and chroma is 2 to 4. Texture is very stony loam or very cobbly fine sandy loam. Clay content is 17 to 25 percent. Rock fragment content is 35 to 60 percent. Reaction is moderately alkaline or strongly alkaline. Calcium carbonate equivalent is 20 to 38 percent.

C horizon: Texture is very stony loam or very cobbly fine sandy loam. Clay content is 17 to 24 percent. Reaction is moderately alkaline or strongly alkaline. Calcium carbonate equivalent is 19 to 30 percent.

Pathead Series

The Pathead series consists of moderately deep, well drained, moderately permeable soils on benches, ridges, canyonsides, and mountain slopes. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slope is 15 to 70 percent. Elevation is 5,900 to 9,000 feet. Average annual precipitation is 14 to 20 inches, and average annual air temperature is 38 to 45 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Typic Ustorthents.

Typical pedon of a Pathead extremely stony loam in an area of Pathead-Curecanti family association, about 2 miles north and 4 miles west of Helper, about 1,100 feet north and 400 feet west of the southeast corner of sec. 6, T. 13 S., R. 9 E.

A1—0 to 3 inches; brown (10YR 5/3) extremely stony loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; 5 percent pebbles, 15 percent cobbles, 40 percent stones, and 5 percent boulders; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1—3 to 14 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and few fine and medium roots; many very fine pores; 20 percent pebbles and 5 percent cobbles; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

C2—14 to 26 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine pores; 20 percent pebbles, 25 percent cobbles, and 5 percent stones; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

R—26 inches; sandstone.

Bedrock is at a depth of 20 to 40 inches. The particle-size control section is 35 to 60 percent rock fragments.

A horizon: Value is 5 or 6 when dry and 3 to 5 when moist, and chroma is 2 or 3. Texture is gravelly loam, cobbly loam, extremely stony fine sandy loam, extremely stony loam, or extremely bouldery fine sandy loam. Reaction is moderately alkaline or strongly alkaline.

C horizon: Hue is 10YR or 2.5Y, value is 6 or 7 when dry and 3 to 5 when moist, and chroma is 2 to 4. Texture is very cobbly loam, extremely cobbly loam, or very stony fine sandy loam. Clay content is 18 to 27 percent. Calcium carbonate equivalent is 11 to 28 percent. Reaction is moderately alkaline or strongly alkaline.

Podo Series

The Podo series consists of shallow, well drained, moderately rapidly permeable soils on benches, mesas, and mountain slopes. These soils formed in residuum and colluvium derived from sandstone, shale, and limestone. Slope is 1 to 70 percent. Elevation is 5,200 to 9,000 feet. Average annual precipitation is 14 to 20 inches, and average annual air temperature is 38 to 45 degrees F.

These soils are loamy, mixed (calcareous), frigid Lithic Ustorthents.

Typical pedon of Podo gravelly sandy loam, 1 to 8 percent slopes, about 26 miles northeast of Sunnyside, about 2,300 feet west and 50 feet south of the northeast corner of sec. 19, T. 12 S., R. 17 E.

A1—0 to 2 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine vesicular pores; 20 percent pebbles; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C1—2 to 8 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine and fine pores; 10 percent pebbles; strongly calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

C2—8 to 11 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; 25 percent pebbles; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—11 inches; sandstone.

Bedrock is at a depth of 8 to 20 inches.

A1 horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry and 3 to 5 when moist, and chroma is 2 to 4. Texture is gravelly sandy loam, gravelly loam, cobbly loam, very stony loam, or very bouldery sandy loam. Calcium carbonate equivalent is 12 to 15 percent.

C horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry and 4 or 5 when moist, and chroma is 2 to 4. Texture is gravelly sandy loam, loam, or gravelly loam. Clay content is 13 to 27 percent. Rock fragment content is 5 to 35 percent. Calcium carbonate equivalent is 22 to 33 percent.

Winetti Series

The Winetti series consists of very deep, well drained, moderately rapidly permeable soils on narrow valley and canyon floors. These soils formed in alluvium derived from sandstone and shale. Slope is 1 to 8 percent. Elevation is 4,600 to 7,200 feet but commonly is 5,200 to 6,400 feet. Average annual precipitation is 12 to 16 inches, and average annual air temperature is 43 to 45 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Typic Ustifluvents.

Typical pedon of a Winetti bouldery sandy loam in an area of Shupert-Winetti complex, about 2.5 miles north of Sunnyside Mine, about 1,800 feet south and 2,500 feet west of the northeast corner of sec. 20, T. 14 S., R. 14 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) bouldery sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable; common very fine, fine, and medium roots and few coarse roots; 4 percent cobbles, 15 percent stones, and 10 percent boulders; slightly calcareous; disseminated calcium carbonate; mildly alkaline (pH 7.6); abrupt smooth boundary.

C1—6 to 11 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common fine pores; 10 percent pebbles; strongly calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.2); clear wavy boundary.

C2—11 to 26 inches; pale brown (10YR 6/3) very bouldery loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine pores; 10 percent pebbles, 5 percent cobbles, 10 percent stones, and 15 percent boulders; strongly calcareous; coatings of calcium carbonate on the underside of rock fragments; moderately alkaline (pH 8.4); abrupt smooth boundary.

C3—26 to 34 inches; brown (10YR 5/3) very bouldery loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common fine pores; 10 percent pebbles, 5 percent cobbles, 10 percent stones, and 15 percent boulders; strongly calcareous; coatings of calcium carbonate on the underside of rock fragments; moderately alkaline (pH 8.4); abrupt smooth boundary.

C4—34 to 60 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; single grain; loose, very friable, slightly sticky; few very fine and fine roots; 40 percent pebbles, 5 percent cobbles, and 5 percent boulders; strongly calcareous; coatings of calcium carbonate on the underside of rock fragments; moderately alkaline (pH 8.4).

The particle-size control section is 35 to 50 percent rock fragments.

C horizon: Value is 5 or 6 when dry and 4 or 5 when moist, and chroma is 2 or 3. Texture is mainly very bouldery loam or very gravelly sandy loam, but there are thin layers of very bouldery sandy clay loam in some pedons. Clay content is 14 to 17 percent.

APPENDIX F

COMPARISON OF SOIL SURVEY MAP UNITS

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT

DETAILED SOIL MAP UNITS COMPARED TO NRCS ORDER 2 MAPPING

DETAILED MAP UNIT SYMBOL	
A	This map unit was in an area originally mapped as UMF2 (Guben-Rabbitex-Pathead Complex, 10 to 50 percent slopes). Soils found in the area mapped as unit A were dominantly Pathead and Cabba.
B	This map unit was part of an area mapped as C107 (Shupert-Winetti Complex, 1 to 8 percent slopes.) The project area is at a higher elevation then is typical of C107. Soils are strongly influenced by colluvium; with very little typical alluvial bottom land soils. Slopes are steeper in the map unit then identification C107. C107 was mapped higher on the adjacent side slopes than in this detailed section.
C	This unit was part of C107. It is at too high of an elevation for the Shupert-Winetti Complex and has steeper slopes and rock outcrop present.
D	This unit was part of C107. The elevation is too high for the Shupert-Winetti Complex and the slope is steeper. It is more of a toeslope position than a bottom land.
E	This unit was mapped within units C107 (Shupert-Winetti Complex) and DHG2 (Commodore-Datino Variant complex, 40 to 60 percent slopes). Map unit C107 is not appropriate due to very steep slopes, colluvial soils, and cooler temperatures. The shallow Commodore soils were not noted at this toeslope position. Soils are mostly formed from deep, very stony colluvial deposits with some shale present.

F This unit was mapped as UMF2 (Guben-Rabbitex-Pathead Complex, 10 to 50 percent slopes). The area mapped as F has steeper slopes than UMF2 and is dominated by very stony soils and sandstone bedrock.

G This soil map unit was originally mapped as UFF2 (Doney-Cabba-Podo Complex, 20 to 60 percent slopes). The map unit components remain the same, however, the slope gradient was increased to 80 percent for Unit G.

MAP A

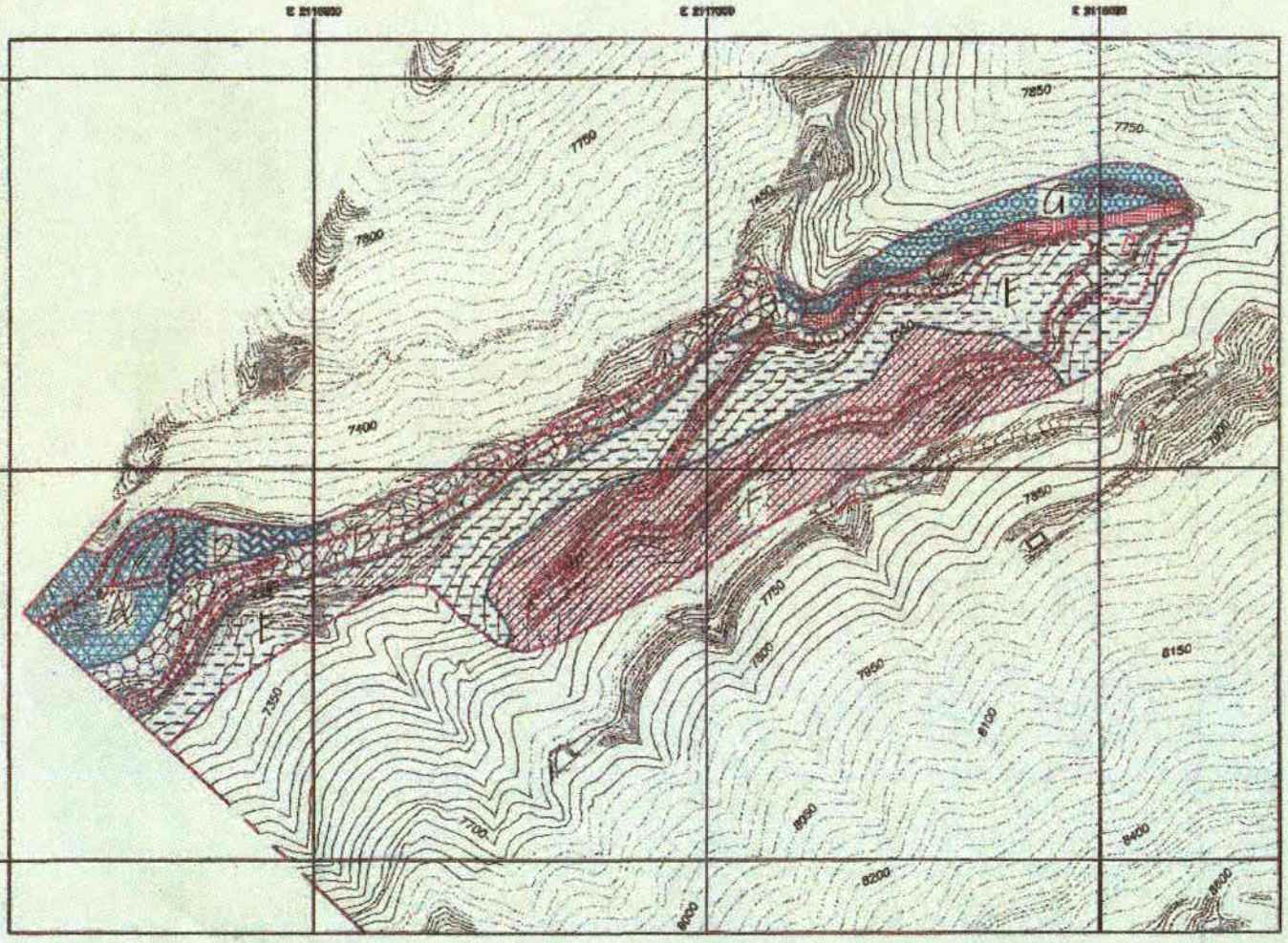
DETAILED SOIL SURVEY MAP

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT

DETAILED SOIL SURVEY MAP
MAP A

BEAR CANYON MINE

Wild Horse Ridge Portal Project



LEGEND:

- A: Pathead - Cabba Complex, 30 to 70% slopes
- B: Winetti, High Elevation, 5 to 30% slopes
- C: Winetti, High Elevation - Rock Outcrop, 10 to 30% slopes
- D: Penny, Deep, 10 to 30% slopes
- E: Datino - Gaben Complex, 30 to 80% slopes
- F: Gaben - Pathead Complex, 30 to 80% slopes
- G: Penny - Cabba - Paolo Complex, 30 to 80% slopes

Soil Survey Project Boundry
Soil Map Unit Boundry
Proposed Disturbed Area Boundry

N

SCALE 1" = 200'

CONTOUR INTERVAL 5'

PHOTOGRAPHY DATE SEP 3, 1991 & OCT 20, 1995

DISCLAIMER:

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CLIENT: C.W. MINING

VIEWING TRIANGLE:

DATE: MAY 1999

SCALE: AS SHOWN

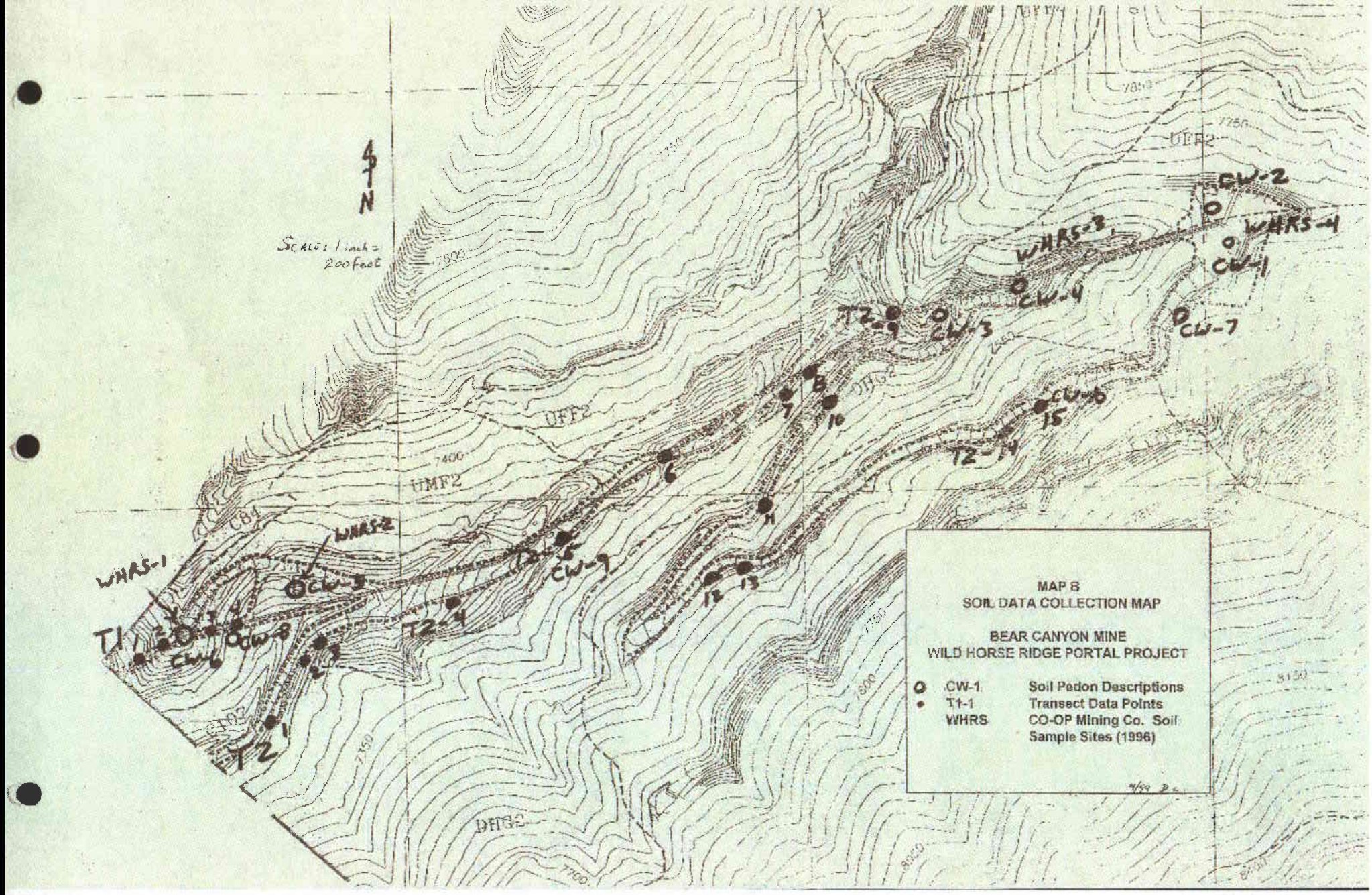
ACAD REF: Bear/ CW. Mining/ Bear Canyon/ MapA

DESIGNED BY: EIS

MAP B

SOIL DATA COLLECTION MAP

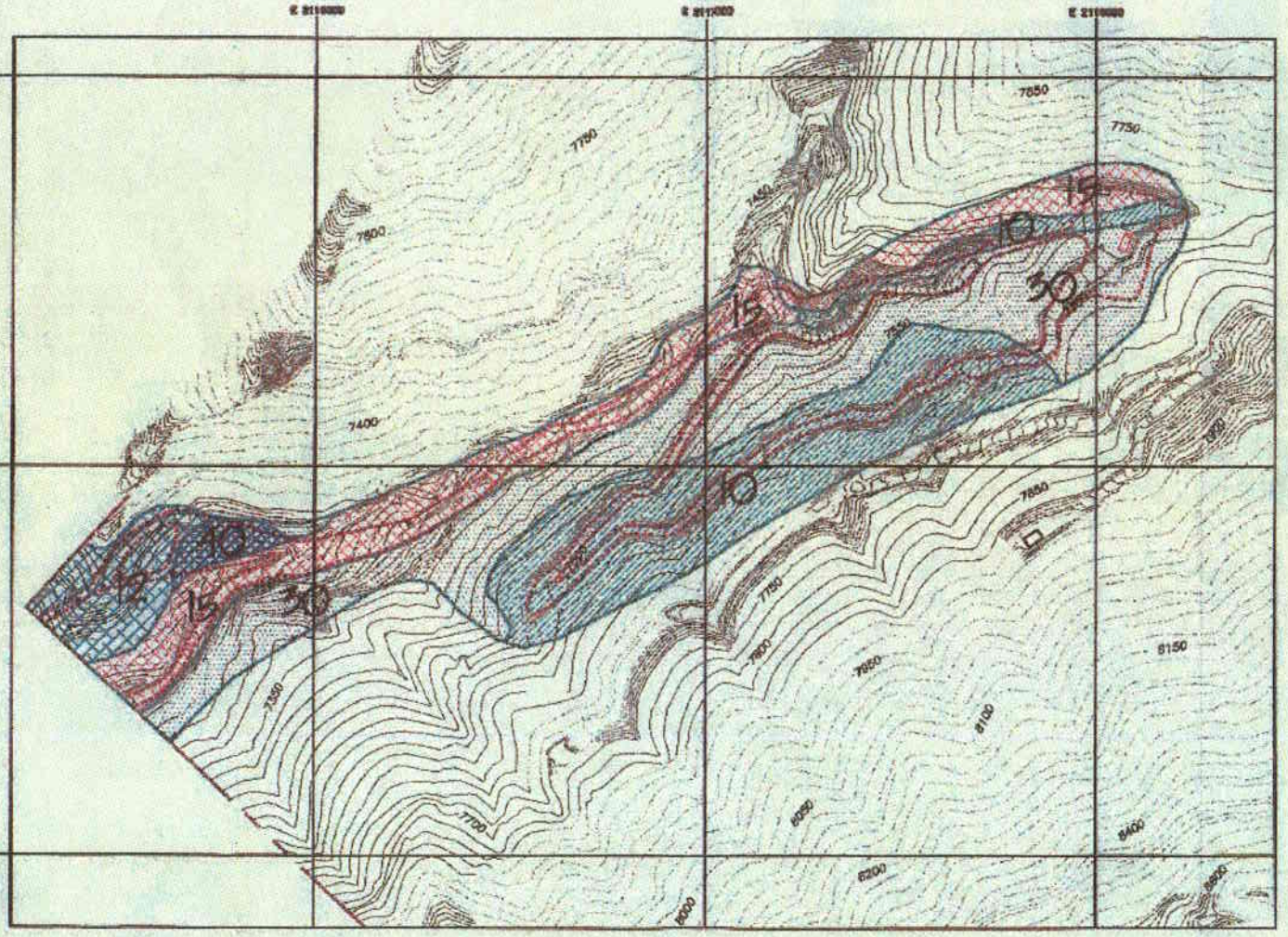
BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT


N
SCALE: 1 inch = 200 feet
MAP B
SOIL DATA COLLECTION MAP
BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT
CW-1 Soil Pedon Descriptions
T1-1 Transect Data Points
WHRS CO-OP Mining Co. Soil Sample Sites (1996)
UFF2
UMF2
DHG2
WHRS-1
WHRS-2
WHRS-3
WHRS-4
CW-1
CW-2
CW-3
CW-4
CW-5
CW-6
CW-7
CW-8
CW-9
T1
T2-1
T2-4
T2-9
T2-14
7400
7450
7500
7550
7600
7650
7700
7750
7800

MAP C

SOIL SUITABILITY MAP

BEAR CANYON MINE
WILD HORSE RIDGE PORTAL PROJECT



SOIL SUITABILITY MAP
MAP C

BEAR CANYON MINE

Wild Horse Portal Project

LEGEND:

Soil Survey Project Boundry
Soil Map Unit Boundry
Proposed Disturbed Area Boundry

APROXIMATE THICKNESS OF SALVAGEABLE SOIL
(Units Given in Inches)

10" 15" 40"
12" 30"

(Excludes Existing Road)

N

SCALE 1"= 200'
200' 100' 0' 200' 400' 600'

CONTOUR INTERVAL 5'
PHOTOGRAPHY DATE SEP 3, 1991 & OCT 29, 1996

DISCLAIMER:

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CLIENT: C.W. MINING

VIEWING TERMS: [illegible]

DATE: MAY 1999

SCALE: AS SHOWN

ACAD REF: [illegible]

DESIGNED BY: EIS

APPENDIX 2-G

WILD HORSE RIDGE TANK SEAM

SOIL RESOURCE INVENTORY AND ASSESSMENT

SOIL RESOURCE INVENTORY AND ASSESSMENT

BEAR CANYON MINE
WILD HORSE RIDGE TANK SEAM PORTAL
EMERY COUNTY, UTAH

For:
C.W. Mining Company
P.O. Box 1245
Huntington, Utah 84528

By:
EIS Environmental &
Engineering Consulting
31 North Main Street
Helper, Utah 84526

December 2001

SOIL INVENTORY AND ASSESSMENT
BEAR CANYON MINE
WILD HORSE RIDGE TANK SEAM PORTAL

Table of Contents

1.0 Introduction

2.0 Methods and Procedures

3.0 Results and Discussion
- **3.1 Soil Mapping and Soil Descriptions**
- **3.2 Soil Laboratory Testing Results and Suitability Rating**
- **3.3 Soil Salvage**

4.0 Appendices
- **A. Soil Suitability**
- **B. Soil Laboratory Testing Results**
- **C. Soil and Landscape Photographs**
- **D. Field Soil Profile Descriptions and Transect Notes**
- **E. NRCS Soil Series and Family Descriptions**

5.0 Soil Survey Map

SOIL INVENTORY AND ASSESSMENT
BEAR CANYON MINE
WILD HORSE RIDGE TANK SEAM PORTAL

1.0 Introduction

This Soils report covers an area consisting of a portal site and road segment for the proposed Wild Horse Ridge Tank Seam Portal at the Bear Canyon Mine. It is an extension to the area covered in a soils report prepared in May 1999 by Environmental Industrial Services (EIS) for the Bear Canyon Mine, Wild Horse Ridge Portal. It is located about eight miles northwest of Huntington in Emery County, Utah (SW ¼, SE ¼, Section 24, T. 16 S., R. 7 E.). Access would be along an existing single lane road that would need some upgrading. The existing road bisects the proposed portal site and continues through the project area to a hunting cabin. The segment of access road for this project is about ¼ mile in length and the portal site is about 2.5 acres.

The project is on a steep northwest facing canyon slope at an elevation of 7,680 to 7,950 feet. The vegetation includes pinyon pine, curlleaf mountain mahogany, Douglas fir, juniper, serviceberry, sagebrush, and grasses. The geologic materials include sandstone, shale and minor amounts of coal from the Blackhawk Formation. The average annual precipitation is estimated at about 16 inches, and average annual air temperature is 38 to 45 degrees F.

2.0 Methods and Procedures

The soil inventory was conducted by Daniel M. Larsen, Soil Scientist, EIS. Project details and the base map were provided by Charles Reynolds, Mining Engineer, C.W. Mining Company; Katie Nash and Barbara Jensen, EIS, assisted with the final report and soils map preparation. Soil testing was conducted by Inter-Mountain Laboratories, Inc., Farmington, New Mexico. Fieldwork was done on October 23, 2001 according to National Soil Survey guidelines and mining project requirements identified by the State of Utah, Division of Oil, Gas and Mining.

Road cuts were used extensively for gathering soils information along the access road as well as at the portal site. Notes were recorded for 21 points and two full soil profile descriptions were recorded on NRCS form 232. Data obtained from the existing road cuts were supplemented by walking over the undisturbed portal site area and making shallow excavations with a tile spade. Deep digging with a spade was limited by the high stone content of the soil at the portal site.

Representative soil samples were collected at the portal site in one-gallon size plastic freezer bags. Five samples were selected for analysis of parameters recommended by the Utah Division of Oil, Gas and Mining. These samples were as follows:

P1	0-8 inches	Soil description site number TSP-1. A-horizon (Guben soil series).
P2	9-20 inches	Soil description site number TSP-1. BK1 horizon.
P3	24-40 inches	Soil description site number TSP-1. BK 2 horizon.
P4	0-7 inches	Composite of A horizon soil from the portal site.
P5	10-20 inches	Soil description number TSP-2. BW horizon (Datino soil series).

See Appendix D, photographs TS-4 and TS-5 for visual information on these sample sites. Field soil profile descriptions and field notes are given in Appendix D.

3.0 Results and Discussion

3.1 Soil Mapping and Soil Descriptions

A soils map was prepared showing various soil map units, soil description locations and note points (Section 5, Soils Map). The units mapped were similar to units in the soils report for Bear Canyon Mine, Wild Horse Ridge Portal in May 1999.

At the portal site the soils are formed from colluvial materials derived from sandstone and shale. Slopes are about 45 percent and the surface is stony to bouldery. Soils have been mapped as the Datino-Guben (DG) soil map unit. These soils are similar with the main difference being that the Guben soil is more calcareous than the Datino soil. Both have a calcium carbonate accumulation in the subsoil, but the Datino soil is not calcareous at the surface.

These soils typically have a dark brown to very dark brown (moist) surface layer with a sandy loam to loam texture. Thickness of the A-horizon is seven to ten inches with an average of about eight inches. The Datino soils have a brown sandy loam layer up to about ten inches in thickness below the A-horizon. Underlying these soil layers is a zone of calcium carbonate accumulation. This soil layer is very cobbly to very stony and has a lighter color than the surface layers. The calcic horizon ranges from about two to three feet in thickness and overlies very stony calcareous colluvium.

The soils at the portal site are classified as loamy-skeletal, mixed, Typic Calciborolls (Guben) and loamy-skeletal, mixed Typic Haploborolls (Datino). Typical soil series descriptions for these soils as identified in Carbon County by the Natural Resources Conservation Services are given in Appendix E.

Along the access road the soils are quite variable. They range form deep cobbly soils formed in colluvium to shallow soils over shale and sandstone bedrock. Topsoils are generally six to ten inches thick and have loam to sandy loam textures. Notable along the access road is a portion that is underlain by shale varying in color from reddish-brown to dark gray. These soils are shallow to moderately deep and often have some cobbly colluvial material at the surface. This soil area was mapped as the Doney-Cabba-Pado (DCP) soil map unit. Topsoils are commonly four to six inches thick but range up to nine inches. Subsoils are clay loam to silty clay.

A small portion of the access road is in the Guben-Pathead (GP) soil map unit. It consists of deep, very cobbly to very stony soils and shallow to moderately deep stony soils over sandstone bedrock. Topsoils range from about four to eight inches in thickness.

All of the soils at the portal site and along the access road are well drained.

3.2 Soil Laboratory Testing Results and Suitability Rating

Data from soil testing conducted by Inter-Mountain Laboratories, Inc. are shown in Appendix B. These data were compared to values of selected parameters to evaluate the soil suitability as a plant growth material as recommended by the Utah Division of Oil, Gas and Mining (DOGM). Criteria used are from table 2 in "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining" by DOGM, 1988. This table is shown in Appendix A.

A summary of the test values and rating is given below:

Parameter	Test Values	Rating
PH	7.1 to 7.7	Good
	8.5 for P3	Fair
Electrical Conductivity	0.46 to 0.85 mmhos/cc	Good
Saturation Percent	27 to 49%	Good
Texture	Sandy Loam to Loam	Good
SAR	0.1 to 0.2	Good
Selenium	Less than 0.02	Good
Boron	0.3 to 1.3 mg./kg.	Good
Acid/Base Potential	7.0 to 386.5 t/kt	Good
Available Water Capacity	0.12 to 0.16 in/in (est.)	Good

Rock fragments were estimated in the field and ranged from about 20 to 30 percent for surface soils and 40 to 60 percent for subsoils. This would yield a fair to poor rating, but is a natural feature of soils in the area.

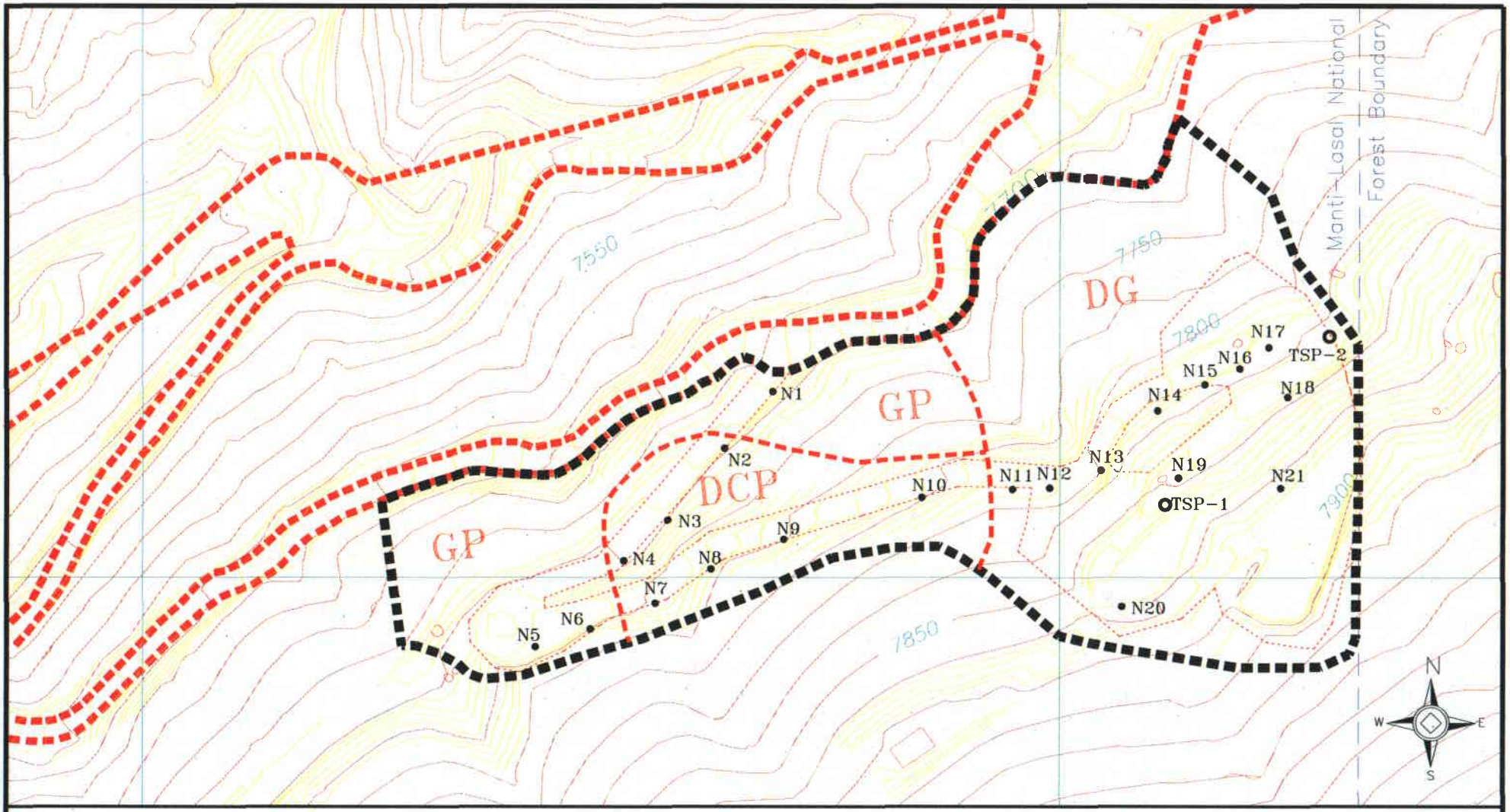
Subsoils are high in calcium carbonate (up to 40 percent) and would rate as fair to poor. Surface soils ranged from 0.8 to 11.5 percent calcium carbonate, which would be good.

Overall the topsoils rate good for plant growth based on laboratory analysis and would be fair when considering the rock fragment content (especially stones and boulders). Subsoils would be fair to poor based on rock fragments and carbonates.

Organic matter, nitrogen, phosphorus, and potassium are all substantially higher in the upper eight inches of topsoil compared to the subsoils.

3.3 Soil Salvage

At the Tank Seam Portal site the topsoil layer averages about eight inches. This is good A-horizon material that should be salvaged. There are pockets of a brown sandy loam BW horizon that extends to about 20 inches. This was only noted along the northeast edge of the portal site. The material is lighter colored than the topsoil but darker than the high carbonate subsoils below. It could be salvaged and mixed with the A-horizon. The subsoils, which are high in carbonates and rock fragment content, would be suitable for plant growth but should not be considered as salvageable topsoil. The subsoil can be readily identified by its lighter color as a result of the increased calcium carbonate content and lower amount of organic matter.



LEGEND

- DISTURBED AREA
- SOIL BOUNDRY
- SECTION LINE
- CONTOUR LINE
- SURVEY BOUNDARY
- PROPOSED DISTRUBED AREA
- TSP-1 SOIL DESCRIPTION AND SAMPLING SITES
- N1 TRANSECT NOTE SITES
- DG DATINO-GUBEN
- GP GUBEN-PATHEAD
- DCP DONEY-CABBA-PODO

E.I.S. is not responsible for errors or omissions. Reference data was provided by C. W. Mining Company.

Acad Ref: COOP MINE, SOILMAPBASE

Date:	Dec. 6, 2001
Drawn by:	BJensen
Approved by:	Dan Larsen
Scale:	1" = 100'

CLIENT:

C. W. MINING COMPANY
BEAR CANYON MINE
WHR TANK SEAM PORTAL

MAP TITLE: SOILS MAP

Environmental Industrial Services
31 North Main
Helper, Utah 84526
(435) 472-3814
eis.gis@elana.com
Environmental & Engineering Consulting

SOIL INVENTORY AND ASSESSMENT
BEAR CANYON MINE
WILD HORSE RIDGE TANK SEAM PORTAL

4.0 APPENDICES

A. Soil Stability Criteria
B. Soil Laboratory Testing Results
C. Soil and Landscape Photographs
D. Field Soil Profile Descriptions and Transect Notes

Appendix A

Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

Soil Suitability Criteria

Reference: Leatherman, James and Dan Duce, 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, State of Utah Department of Natural Resources, Division of Oil, Gas and Mining. Salt Lake City, Utah.

Soil Suitability Criteria

UDOGM: Overburden Evaluation for Vegetative Root Zone; Table 2 (Leatherwood and Duce 1988)

Parameters	Good	Fair	Poor	Unacceptable
pH	6.1 - 8.2	5.1 - 6.1 8.2 - 8.4	4.5 - 5.0 8.5 - 9.0	less than 4.5 greater than 9.0
Ec mmhos/cm 25°C	0 - 2	2 - 8	8 -15	greater than 15
Saturation %	25% - 80%		less than 25% greater than 80%	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
SAR	0 - 4	5 - 10	10 - 12 Fine Texture 10 - 15 Coarse Texture	12 Fine Texture 15 Coarse Texture
Selenium	less than 0.1 mg/Kg			greater than 0.1 mg/Kg
Boron	less than 5.0 mg/Kg			greater than 5.0 mg/Kg
Acid/Base Potential	greater than -5 tons $CaCO_3$ 1,000 tons material			less than -5 tons $CaCO_3$ 1,000 tons material
% Coal fines	Undetermined at this time			
Available water capacity (in/in)	greater than 0.10	0.05 - 0.10	less than 0.05	
Rock Fragments (% volumes) 3 inches 3 - 10 inches 10 inches	 0 - 15 0 - 15 0 - 3	 15 - 25 15 - 25 3 - 7	 25 - 30 25 - 30 7 - 10	 greater than 30 greater than 30 greater than 10

Appendix B

Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

Soil Laboratory Testing Results

Soil Sample Identification
Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

P1	0-8 inches	Soil description site number TSP-1. A horizon (Guben soil series).
P2	9-20 inches	Soil description site number TSP-1. BK1 horizon.
P3	24-40 inches	Soil description site number TSP-1. BK 2 horizon.
P4	0-7 inches	Composite of A horizon soil from the portal site.
P5	10-20 inches	Soil description number TSP-2. BW horizon (Datino soil series).

Soil Sample Colors (Munsell)

Sample I.D.	Dry Color	Moist Color
P1 0-8 inches	10 YR 4/3 (Brown)	10 YR 3/2 (Dark Brown)
P2 9-20 inches	10 YR 5/3 to 6/3 (Brown to Pale Brown)	10 YR 4/3 to 5/3 (Brown)
P3 24-40 inches	10 YR 6/3 (Pale Brown)	10 YR 5/3 (Brown)
P4 0-7 inches	7.5 YR 4/3 to 10 YR 4/3 (Brown)	7.5 YR 2.5/2 (Very Dark Brown)
P5 10-20 inches	7.5 YR 5/4 to 5 YR 5/4 (Brown to Reddish Brown)	7.5 YR 4/4 (Brown)

iml

Inter-Mountain Laboratories, Inc.

Phone (505) 326-4737 Fax (505) 325-4182

2506 West Main Street, Farmington, NM 87401

November 14, 2001

Daniel M. Larsen
Environmental Industrial Services
31 North Main Street
Helper, UT 84526

Dear Mr. Larsen:

Attached are the analytical results for the samples received by IML on October 29, 2001. The samples were labeled C.W. Mining Co. – Portal Site and correspond to IML lab numbers 0301S04726-4730. The requested analysis were pH, EC, sat %, SAR, texture incl. very fine sand, calcium carbonate %, acid-base potential, alkalinity, organic matter, total organic carbon, AB-DTPA extractable selenium, boron, phosphorous, potassium, nitrate – N, and total Kjeldahl nitrogen.

If you have any questions or comments please call (800) 828-1409. Thank you for choosing Inter-Mountain Labs.

Sincerely,

Jeff Goats
Soil Scientist
IML – Farmington

Enclosure: Analytical Report

Inter-Mountain Laboratories, Inc.
Phone (505) 326-4737 Fax (505) 325-4182
2506 West Main Street, Farmington, NM 87401

C.W. Mining Co.
Huntington, UT

Client Project ID: Bear Canyon Mine - Tank Seam Portal
Date Received: 10/29/01

IML Project #0301S04726
Report Date: 11/14/01

Lab Id	Sample Id	Depths Inches	pH s.u.	Electrical Conductivity mmhos/cm	Saturation %	Ca meq/L	Mg meq/L	Na meq/L	SAR ratio	Sand %	Silt %	Clay %	Texture USDA	Sand, Very Fine %
0301S04726	P1 TSP-1	(0 - 8)	7.5	0.68	49	6.5	1.5	0.20	0.1	61	21	18	SL	12
0301S04727	P2 TSP-1	(9 - 20)	7.8	0.46	42	5.3	0.90	0.22	0.1	51	29	20	L	8
0301S04728	P3 TSP-1	(24 - 40)	8.5	0.55	27	1.9	4.8	0.43	0.2	59	27	14	SL	11
0301S04729	P4 Composite	(0 - 7)	7.1	0.85	39	6.3	2.3	0.29	0.1	69	19	12	SL	10
0301S04730	P5 TSP-2	(10 - 20)	7.7	0.46	29	3.8	1.4	0.32	0.2	69	17	14	SL	10

Inter-Mountain Laboratories, Inc.
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C.W. Mining Co.
Huntington, UT

Client Project ID: Bear Canyon Mine - Tank Seam Bital
Date Received: 10/29/01

IML Project #0301S04726
Report Date: 11/14/01

Lab Id	Sample Id		Depths Inches	Total Sulfur %	Neutral. Potential t/kt	Acid Base Total S t/kt	ABP Total S t/kt	Alkalinity meq/L	Calcium Carbonate %	TOC %	Organic Matter %	Nitrate - N mg/Kg	Phosphorous mg/Kg	Potassium mg/Kg	Total Kjeldah Nitrogen %
0301S04726	P1	TSP-1	(0 - 8)	0.02	116.4	0.6	115.8	6.8	11.5	1.5	2.6	5.0	3.0	170	0.14
0301S04727	P2	TSP-1	(9 - 20)	0.02	387.1	0.6	386.5	6.0	40.6	1.0	1.7	1.9	1.3	28	0.09
0301S04728	P3	TSP-1	(24 - 40)	0.01	307.9	0.3	307.6	4.8	30.6	0.4	0.7	1.9	<0.1	26	0.03
0301S04729	P4	Composite	(0 - 7)	0.02	9.3	0.6	8.7	2.6	0.8	1.3	2.2	1.0	3.2	310	0.10
0301S04730	P5	TSP-2	(10 - 20)	0.01	7.3	0.3	7.0	3.6	0.8	0.3	0.5	2.9	0.8	69	0.03

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Lab Id	Sample Id		Depths Inches	Boron Soluble mg/Kg	Selenium AB - DTPA mg/Kg
0301S04726	P1	TSP-1	(0 - 8)	1.3	<0.02
0301S04727	P2	TSP-1	(9 - 20)	0.6	<0.02
0301S04728	P3	TSP-1	(24 - 40)	0.5	<0.02
0301S04729	P4	Composite	(0 - 7)	1.2	<0.02
0301S04730	P5	TSP-2	(10 - 20)	0.3	<0.02

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Client Project ID: Bear Canyon Mine - Tank Seam Portal

IML Project #0301S04726

Date Received: 10/29/01

Report Date: 11/14/01

Lab Id	Sample Id (Tank Seam Portal Site)	Depths Inches	pH s.u.	Electrical Conductivity mmhos/cm	Saturation %	Ca meq/L	Mg meq/L	Na meq/L	SAR ratio	Sand %	Silt %	Clay %	Texture USDA	Sand, Very Fine %
0301S04725	P1 TSP-1	(0 - 8)	7.5 G	0.68 G	49 G	6.5	1.5	0.20	0.1 G	61	21	18	SL G	12
0301S04727	P2 TSP-1	(9 - 20)	7.8 G	0.46 G	42 G	5.3	0.90	0.22	0.1 G	51	29	20	L G	8
0301S04728	P3 TSP-1	(24 - 40)	8.5 F	0.55 G	27 G	1.9	4.8	0.43	0.2 G	59	27	14	SL G	11
0301S04729	P4 Composite	(0 - 7)	7.1 G	0.85 G	39 G	6.3	2.3	0.29	0.1 G	69	19	12	SL G	10
0301S04730	P5 TSP-2	(10 - 20)	7.7 G	0.46 G	29 G	3.8	1.4	0.32	0.2 G	69	17	14	SL G	10

With evaluation notes (DMH)

F - Fair
G - Good

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Lab Id	Sample Id		Depths Inches	Total Sulfur %	Neutral Potential t/kt	Acid Base Total S t/kt	ABP Total S t/kt	Alkalinity meq/L	Calcium Carbonate %	TOC %	Organic Matter %	Nitrate - N mg/Kg	Phosphorous mg/Kg	Potassium mg/Kg	Total Kjeldah Nitrogen %
0301S04726	P1	TSP-1	(0 - 8)	0.02	116.4	0.6	115.8 G	6.8	11.5	1.5	2.6	5.0	3.0	170	0.14
0301S04727	P2	TSP-1	(9 - 20)	0.02	387.1	0.6	386.5 G	6.0	40.6 *	1.0	1.7	1.9	1.3	28	0.09
0301S04728	P3	TSP-1	(24 - 40)	0.01	307.9	0.3	307.6 G	4.8	30.6 *	0.4	0.7	1.9	<0.1	26	0.03
0301S04729	P4	Composite	(0 - 7)	0.02	9.3	0.6	8.7 G	2.6	0.8	1.3	2.2	1.0	3.2	310	0.10
0301S04730	P5	TSP-2	(10 - 20)	0.01	7.3	0.3	7.0 G	3.6	0.8	0.3	0.5	2.9	0.8	69	0.03

Topsoil

* Calcic horizon

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IML Project #0301S04726
Report Date: 11/14/01

Lab Id	Sample Id		Depths Inches	Boron Soluble mg/Kg	Selenium AB - DTPA mg/Kg
0301S04726	P1	TSP-1	(0 - 8)	1.3 G	<0.02 G
0301S04727	P2	TSP-1	(9 - 20)	0.6 G	<0.02 G
0301S04728	P3	TSP-1	(24 - 40)	0.5 G	<0.02 G
0301S04729	P4	Composite	(0 - 7)	1.2 G	<0.02 G
0301S04730	P5	TSP-2	(10 - 20)	0.3 G	<0.02 G

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Appendix C

Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

Soil and Landscape Photographs

By, D. Larsen, EIS Environmental & Engineering Consulting
October 23, 2001

TS-1
At the proposed WHR Tank Seams Portal site showing the general vegetation, landform and deep colluvial soil materials.

TS-2
Soils at the WHR Tank Seam Portal site exposed by the road cut in the Guben-Datino soil unit. The spade is 44 inches long.

TS-3

The location of soil description TSP-1 at the WHR Tank Seam Portal site.

TS-4

Soil profile of the Guben soil recorded as description TSP-1. Soil samples P1 (0-8 inches), P2 (9-20 inches), and P3 (24-40 inches) were taken from this site.

TS-5

Site of soil description TSP-2 and soil sample P5 (10-20 inches) at the northeast edge of the portal site. The brown soil layer is not calcareous and the soil classifies as the Datino series.

TS-6

Sandstone bedrock exposed along the access road at Note Point N1. Soils are shallow to moderately deep over bedrock and consist of Podo and Pathead soils.

TS-7

Soils at Note Point N2. A thin layer of cobbly colluvium over shale. Topsoil varies from 4 to 8 inches in thickness.

TS-8

Soil exposed on a road cut along the access road at Note Point N3. This is in the DCP (Doney-Cabba-Pado) soil unit. The soils are shallow to moderately deep over shale and have thin topsoils.

TS-9

Soils at Note Point N7 on stratified shale and coal within the DCP soil unit along the access road.

TS-10

Soils on reddish colored shale in the DCP soil unit along the access road at Note Point N9.

TS-11

Road cut showing geologic materials and soils at Note Points N5 and N6 within the Guben-Pathead (GP) soil unit. At the far end of the road cut the soils are formed mostly on shale of the DCP (Doney-Cabba-Pado) soil unit.

TS-12

A Guben soil along the access road at Note Point N12.

Appendix D

Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

Field Soil Profile Descriptions and Transect Notes

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

C.W. Mining Co. Proj.

SOIL DESCRIPTION

Soil type Guben — Tank Seam Portal — File No. TSP-1

Area Bear Canyon Mine - Wildhorse Upper Portal site — Date D. Larsen 10-23-01 — Stop No. 1

Classification Loamy skeletal, mixed, Typic Calciboroll

Location South 1/3 of portal site

N. veg. (or crop) Curlleaf mahogany, Douglas-Fir, Serviceberry, pinyon pine, grasses — Climate Frigid, Ustic

Parent material Sandstone and shale - Colluvium

Physiography Mountain side / Canyon side

Relief Steep, simple slope — Drainage Well drained — Salt or alkali —

Elevation 7850 feet — Gr. water — — Stoniness V. stony - Bouldery

Slope 45% — Moisture — Dry

Aspect NW 335° — Root distrib. No root restricting layers — % Clay* 17

Erosion Slight — % Coarse fragments* 50-60 — % Coarser than V.F.S.* 50-60%

Permeability Moderate — About 16% of sand is vfs

Additional notes

Boulder surface ≈ 10% cover

Sampled: A 0-8" P1
BK1 9-20" P2
BK2 24-40" P3

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		5
Cobble 3-10"		5
Stone 10-24"		10
Boulder >24"		10
Vegetation		30
Litter		35
Bare		5

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution		
A	Range 8-11 0-9	Brown 10YR 4/3	Dark Brown 10YR 3/2	18 c SL	WFGR	SO	FR	SS/SP	em 7.5	CW	10G 15C. 10S.	MVF-F CM-Co		
BK1	9-24	Brown To Pale brown 10YR 5/3-6/3	Brown 10YR 4/3-5/3	20 c L	WFSBK	SH	SFI	SS/SP	es 7.8	GW	30G 20C 10S	CF		
BK2	24-40	Pale Brown 10YR 6/3	Brown 10YR 5/3	14 c SL	WFSBK-OM	SH	SFI	SS/SP	es 8.5	GW	"	FF		
C	40-60+	10YR 5/3-6/3	Brown 10YR 4/3	SL	OM	SH	SFI	SS/SP	es ≈8.0		"			

SCS-SOILS-232G
REV. 12-70
FILE CODE SOILS-11

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

C. W. Mining Co. Proj.

Soil type Dativo — Tank Seam Portal — File No. TSP-2

Area Bear Canyon Mine – Wildhorse upper portal site | Date 10-23-01 D. Larsen | Stop No. 2

Classification Loamy-skeletal, mixed, Typic Haploboroll

Location North end of road cut, switch back at portal site

N. veg. (or crop) Douglas-Fir, curlleaf mahogany, grasses | Climate Frigid, Ustic

Parent material Sandstone, colluvium

Physiography Mountain side / Canyon side

Relief v. steep	Drainage Well drained	Salt or alkali –
Elevation 7830'	Gr. water –	Stoniness Very stony / Bouldery
Slope 55%	Moisture	
Aspect NW	Root distrib. NOT restricted	% Clay * 7/16
Erosion –	% Coarse fragments * 50	% Coarser than V.F.S.* 55-60%

Permeability Mod. rapid

Additional notes

Sampled Bw @ 9-20" - P5

P4, A 0-7 part of a composite

GROUND COVER (%)	RANGE	AVERAGE
Gravel 2MM-3"		5
Cobble 3-10"		5
Stone 10-24"		15
Boulder >24"		15
Vegetation		20
Litter		40
Bare		5

* Control section average

Horizon	Depth inches	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	% Rock Fragments	Root Distribution		
A	0-7	Brown 7.5YR 4/5 – 10YR 4/3	Dk. Brown 7.5YR 3.5/2	SL	WFGR	SO	FR	SS SP	80 7.2	CW	10 G 15 C 5 S	CVF-F FM		
Bw	7-23	Brown to Reddish Br. 7.5YR 5/4 – 5YR 5/4	Brown 7.5YR 4/4	SL	WFSBK	SO	FR	SS SP	80 7.7	CW	15 G 15 C 10 S	FVF-F		
Bk	23-50	Pale Br. 10YR 5/3-6/3	Brown 10YR 4/3-5/3	SL	WFSBK-OM	SH	SFI	SS SP	CS	BW	15 G 15 C 10 S 10 B			
C	50-60+	10YR 5/3	10YR 4/3	SL	OM	SH	SFI	SS/SP	CS		15 G 20 C 10 S 12 B			

Soil Inventory Field Notes 11/23/01 DMX.
Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal
(See Soils Map for locations)

N1 - Reddish colored sandstone bedrock along access road. Shallow and moderately deep soils (Pado and Pathead). About 6 inches of Topsoil.

N2 - Mixed shale and cobbly colluvium over clayey shale material. Topsoil ranges from 4 to 8 inches thick. 10YR 3/2 loam over clay loam.

N3 - Cobbly soil over shale at about 1 to 3 feet in depth. Topsoil is about 5 to 6 inches thick. Loam to silty clay loam textures.

N4 - About 8 inches of Topsoil (A-horizon) over reddish colored shale and pockets of cobbly colluvium. Mostly a clay loam to silty clay loam texture.

N5 - Cobbly colluvium with boulders near the switchback in the access road. Some calcic horizon development

N6 – Rocky roadcut. Mixed cobbly colluvium, shale, and coal. Sandstone bedrock at about 4 to 8 feet. Calcic horizon is discontinuous; mostly in colluvium.

N7 – 6 to 8 inches of dark colored topsoil (A-horizon) over a grayish colored shale stratified with yellowish brown. Loam over silty clay loam.

N8 – About 4 inches of topsoil over alternate gray, brown, and reddish colored shale. Shallow to moderately deep. Clay loam and silty clay loam.

N9 – About 8 inches of A horizon over weathered reddish colored shale. 50% slope, Douglas-fir, Curlleaf mahogany. Silty clay loam

N10 – 10 inches of topsoil (A) over reddish shaly material.

N11 – 10 inches of loamy topsoil (A) over cobbly Bk horizon. Gibson soil

N12 - Loamy-skeletal Calciboroll, Guban soil.

N13 - Concentration of large boulders at a slight draw (weakly formed drainage).

N14 - Bouldery, loamy-skeletal Calciboroll 10 to 12" of dark colored A horizon over a Bk horizon (Calcic)

N15 - 12 inches of A horizon over a cobbly Bk. 1-sk, Calciboroll, Guban soil

N16 - Loamy-skeletal Calciboroll (Guban) About 20 inches to the Bk horizon

N17 - At switchback by portal site
8 inches of A-horizon (Topsoil)
Loamy-skeletal, Calciboroll (Guban)
Has a calcic horizon, cobbly colluvium

N18 - Road cut at portal site
Very deep stony colluvium
(stones, cobble, & boulders)
Carbonate layer at 1 to 2 feet
7-10 inches of A horizon
Spots of Bw (brown sandy loam) up to 10 inches
Thick That in non calcareous like Dalton soils

N19 - Description site for TSP-1
Deep cobbly colluvium
loamy-skeletal, Typic Calciborroll
45% slope, Curlleaf mahogany, D-fir
8" of A horizon - Loamy

N20 - Stony and bouldery along slight draw
mostly Douglas-fir, at edge of
partial site. - Too stony to dig
est. weaker Bk horizon

N21 General area of Topsoil sample
identified as P4 (0-7") Are. sandy
loam, Stony and bouldery surface
Slightly more sandy on northeast edge.
Weaker calcic horizon on SW corner
Very difficult digging due to stones, Mostly
checked Topsoil and used roadcuts for deeper
information.
Site is quite uniform and materials
appear similar on the site. Some
spots are more calcareous. Walked over
the site up to the flagged edge.

Appendix E

Bear Canyon Mine
Wild Horse Ridge Tank Seam Portal

NRCS Soil Series and Family Descriptions

Reference: Jensen, Earl H. and James W. Borchert, 1988. Soil Survey on Carbon Area, Utah. USDA Soil Conservation Service.

Cabba Family

The Cabba family consists of shallow, well drained, moderately permeable soils on benches, canyon rims, and steep canyonsides. These soils formed in residuum and colluvium derived dominantly from shale or siltstone of the Green River Formation. Slope is 3 to 70 percent. Elevation is 5,000 to 8,200 feet. Average annual precipitation ranges from 12 to 16 inches, and average annual air temperature ranges from 42 to 45 degrees F.

These soils are loamy, mixed (calcareous), frigid, shallow Typic Ustorthents.

Reference pedon of a Cabba family bouldery loam in an area of Cabba family-Guben-Rock outcrop complex, on the slopes of Cottonwood Ridge, about 250 feet west and 1,500 feet north of the southeast corner of sec. 7, T. 13 S., R. 16 E.

A1—0 to 3 inches; pale brown (10YR 6/3) bouldery loam, brown (10YR 4/3) moist; moderate medium granular structure parting to moderate fine granular; loose, slightly sticky and slightly plastic; common very fine and fine roots; 5 percent pebbles, 10 percent cobbles, and 15 percent boulders; slightly calcareous; disseminated calcium carbonate; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1—3 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; loose, slightly sticky and slightly plastic; common very fine and fine roots; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C2—7 to 15 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly calcareous; moderately alkaline (pH 8.3); abrupt smooth boundary.

C3r—15 inches; rippable shale; soft carbonate coatings on surface of rock.

Paralithic contact is at a depth of 8 to 20 inches.

A horizon: Hue is 10YR or 5Y, and value is 4 or 5 when moist. Texture is gravelly loam, bouldery loam, or extremely channery loam.

C horizon: Hue is 10YR or 2.5Y, value is 5 or 6 when dry, and chroma is 2 to 4. Texture is loam, gravelly loam, or clay loam. Clay content is 20 to 35 percent. Rock fragment content is 0 to 30 percent.

Datino Series

The Datino Series consists of very deep, well drained, moderately permeable soils on canyonsides and mountain slopes. These soils formed in colluvium derived dominantly from sandstone and shale. Slope is 15 to 80 percent. Elevation is 6,800 to 8,700 feet. Average annual precipitation ranges from 16 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Haploborolls.

Typical pedon of a Datino extremely stony fine sandy loam in an area of Perma family-Datino complex, about 0.25 mile south of Soldier Creek Mine, 2,400 feet west and 2,200 feet south of the northeast corner of sec. 18, T. 13 S., R. 12 E.

A1—0 to 10 inches; brown (10YR 4/3) extremely stony fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium and coarse roots; few very fine pores; 15 percent pebbles, 25 percent cobbles, and 25 percent stones; moderately alkaline (pH 7.9); clear smooth boundary.

B2—10 to 16 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine pores and few medium pores; 15 percent pebbles, 15 percent cobbles, and 10 percent stones; slightly calcareous; moderately alkaline (pH 7.9); gradual wavy boundary.

Clca—16 to 41 inches; pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common very fine and fine pores; 15 percent pebbles, 20 percent cobbles, and 25 percent stones; strongly calcareous; soft powdery masses of calcium carbonate; moderately alkaline (pH 8.0); gradual smooth boundary.

C2—41 to 60 inches; pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few very fine pores; 15 percent pebbles, 20 percent cobbles, and 25 percent stones; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 7.9).

Secondary calcium carbonate is at a depth of 15 to 22 inches. The mollic epipedon is 10 to 15 inches thick. The solum is 15 to 22 inches thick. The particle-size control section is 35 to 60 percent rock fragments.

A horizon: Value is 4 or 5 when dry and 2 or 3 when moist, and chroma is 2 or 3.

B2 horizon: Value is 3 to 5 when dry and 2 to 4 when moist, and chroma is 2 or 3. Clay content is 18 to 26 percent. Rock fragment content is 35 to 45 percent. Reaction is mildly alkaline or moderately alkaline.

C horizon: Value is 5 or 6 when dry, and chroma is 2 or 3. Clay content is 16 to 25 percent. Rock fragment content is 40 to 70 percent. Reaction is mildly alkaline or moderately alkaline.

Doney Family

The Doney family consists of moderately deep, well drained, moderately permeable soils on benches, foot slopes, and mountain slopes. These soils formed in residuum and colluvium derived dominantly from siltstone, shale, and sandstone. Slope is 3 to 70 percent. Elevation is 6,700 to 9,500 feet. Average annual precipitation ranges from 14 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are fine-loamy, mixed, frigid Typic Ustochrepts.

Reference pedon of a Doney family stony loam in an area of Rabbitex-Doney family-Midfork family complex, about 7.5 miles northwest of Helper, 800 feet south and 1,800 feet east of the northwest corner of sec. 19, T. 12 S., R. 9 E.

A1—0 to 4 inches; brown (10YR 5/3) stony loam, dark brown (10YR 3/3) moist; weak medium platy structure parting to moderate medium granular; soft, friable; common very fine and fine roots; few very fine pores; 10 percent pebbles, 5 percent cobbles, and 5 percent stones; slightly calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); abrupt smooth boundary.

B21—4 to 11 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and common fine roots; few very fine pores; 5 percent pebbles and 5 percent cobbles; slightly calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); gradual smooth boundary.

B22—11 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine pores; 10 percent pebbles; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); gradual smooth boundary.

C1—15 to 24 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; massive; loose, very friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; 10 percent pebbles; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

C2—24 to 35 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; massive; loose, very friable, slightly sticky; few fine roots; few very fine pores; 15 percent pebbles; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 9.0); gradual smooth boundary.

C3r—35 inches; weathered shale.

Paralithic contact is at a depth of 20 to 40 inches. The particle-size control section is 0 to 15 percent rock fragments.

A1 horizon: Hue is 10YR or 2.5Y, value is 5 or 6 when dry, and chroma is 2 or 3. Texture is gravelly sandy loam, silt loam, and stony loam. Clay content is 15 to 22 percent.

B horizon: Hue is 10YR or 2.5Y, value is 5 to 7 when dry and 4 to 6 when moist, and chroma is 2 or 3. Texture is loam or clay loam. Clay content is 18 to 30 percent.

C horizon: Hue is 10YR or 2.5Y, value is 6 or 7 when dry and 5 or 6 when moist, and chroma is 2 or 3. Texture is loam or clay loam.

Guben Series

The Guben series consists of very deep, well drained, moderately permeable soils on canyonsides and mountain slopes. These soils formed in colluvium derived dominantly from sandstone and shale. Slope is 15 to 75 percent. Elevation is 5,000 to 9,500 feet. Average annual precipitation ranges from 14 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Calciborolls.

Typical pedon of Guben extremely bouldery loam in an area of Cabba family-Guben-Rock outcrop complex, in Prickly Pear Canyon, about 1,200 feet south and 2,000 feet east of the northwest corner of sec. 14, T. 12 S., R. 15 E.

O1—0.5 inch to 0; pine needles and grasses.

A1—0 to 7 inches; grayish brown (10YR 5/2) extremely bouldery loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; 15 percent pebbles, 10 percent cobbles, 5 percent stones, and 10 percent boulders; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.2); clear wavy boundary.

B2—7 to 15 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, medium, and coarse roots; 10 percent pebbles, 15 percent cobbles, and 20 percent stones; moderately calcareous; disseminated calcium carbonate; moderately alkaline (pH 8.4); clear wavy boundary.

C1ca—15 to 30 inches; very pale brown (10YR 7/3) very stony loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; few very fine and fine pores; 10 percent pebbles, 20 percent cobbles, 20 percent stones, and 5 percent boulders; strongly calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); clear smooth boundary.

C2—30 to 60 inches; light yellowish brown (10YR 6/4) very stony loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine and medium pores and common fine pores; 10 percent pebbles, 20 percent cobbles, 25 percent stones, and 5 percent boulders; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 9.0).

The mollic epipedon is 7 to 10 inches thick. The solum is 15 to 24 inches thick. The particle-size control section is 35 to 60 percent rock fragments. Secondary calcium carbonate is at a depth of 11 to 24 inches.

A horizon: Value is 4 or 5 when dry, and chroma is 2 or 3. Texture is extremely bouldery loam, extremely stony loam, or extremely bouldery fine sandy loam. Reaction is mildly alkaline or moderately alkaline. Calcium carbonate equivalent is 11 to 19 percent.

B horizon: Hue is 10YR or 7.5YR, value is 5 or 6 when dry and 3 or 4 when moist, and chroma is 2 to 4. Texture is very stony loam or very cobbly loam. Clay content is 17 to 22 percent. Rock fragment content is 35 to 55 percent. Reaction is mildly alkaline or moderately alkaline. Calcium carbonate equivalent is 20 to 25 percent.

Cca horizon: Hue is 7.5YR or 10YR, value is 6 or 7 when dry and 5 or 6 when moist, and chroma is 2 to 4. Texture is very stony loam or very cobbly fine sandy loam. Clay content is 17 to 25 percent. Rock fragment content is 35 to 60 percent. Reaction is moderately alkaline or strongly alkaline. Calcium carbonate equivalent is 20 to 38 percent.

C horizon: Texture is very stony loam or very cobbly fine sandy loam. Clay content is 17 to 24 percent. Reaction is moderately alkaline or strongly alkaline. Calcium carbonate equivalent is 19 to 30 percent.

Pathead Series

The Pathead series consists of moderately deep, well drained, moderately permeable soils on benches, ridges, canyonsides, and mountain slopes. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slope is 15 to 70 percent. Elevation is 5,900 to 9,000 feet. Average annual precipitation is 14 to 20 inches, and average annual air temperature is 38 to 45 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Typic Ustorthents.

Typical pedon of a Pathead extremely stony loam in an area of Pathead-Curecanti family association, about 2 miles north and 4 miles west of Helper, about 1,100 feet north and 400 feet west of the southeast corner of sec. 6, T. 13 S., R. 9 E.

A1—0 to 3 inches; brown (10YR 5/3) extremely stony loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; 5 percent pebbles, 15 percent cobbles, 40 percent stones, and 5 percent boulders; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.6); abrupt smooth boundary.

C1—3 to 14 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and few fine and medium roots; many very fine pores; 20 percent pebbles and 5 percent cobbles; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

C2—14 to 26 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine pores; 20 percent pebbles, 25 percent cobbles, and 5 percent stones; moderately calcareous; disseminated calcium carbonate; strongly alkaline (pH 8.8); clear smooth boundary.

R—26 inches; sandstone.

Bedrock is at a depth of 20 to 40 inches. The particle-size control section is 35 to 60 percent rock fragments.

A horizon: Value is 5 or 6 when dry and 3 to 5 when moist, and chroma is 2 or 3. Texture is gravelly loam, cobbly loam, extremely stony fine sandy loam, extremely stony loam, or extremely bouldery fine sandy loam. Reaction is moderately alkaline or strongly alkaline.

C horizon: Hue is 10YR or 2.5Y, value is 6 or 7 when dry and 3 to 5 when moist, and chroma is 2 to 4. Texture is very cobbly loam, extremely cobbly loam, or very stony fine sandy loam. Clay content is 18 to 27 percent. Calcium carbonate equivalent is 11 to 28 percent. Reaction is moderately alkaline or strongly alkaline.

Podo Series

The Podo series consists of shallow, well drained, moderately rapidly permeable soils on benches, mesas, and mountain slopes. These soils formed in residuum and colluvium derived from sandstone, shale, and limestone. Slope is 1 to 70 percent. Elevation is 5,200 to 9,000 feet. Average annual precipitation is 14 to 20 inches, and average annual air temperature is 38 to 45 degrees F.

These soils are loamy, mixed (calcareous), frigid Lithic Ustorthents.

Typical pedon of Podo gravelly sandy loam, 1 to 8 percent slopes, about 26 miles northeast of Sunnyside, about 2,300 feet west and 50 feet south of the northeast corner of sec. 19, T. 12 S., R. 17 E.

A1—0 to 2 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine vesicular pores; 20 percent pebbles; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C1—2 to 8 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; few very fine and fine pores; 10 percent pebbles; strongly calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

C2—8 to 11 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; 25 percent pebbles; strongly calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—11 inches; sandstone.

Bedrock is at a depth of 8 to 20 inches.

A1 horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry and 3 to 5 when moist, and chroma is 2 to 4. Texture is gravelly sandy loam, gravelly loam, cobbly loam, very stony loam, or very bouldery sandy loam. Calcium carbonate equivalent is 12 to 15 percent.

C horizon: Hue is 7.5YR or 10YR, value is 5 or 6 when dry and 4 or 5 when moist, and chroma is 2 to 4. Texture is gravelly sandy loam, loam, or gravelly loam. Clay content is 13 to 27 percent. Rock fragment content is 5 to 35 percent. Calcium carbonate equivalent is 22 to 33 percent.

Chapter 3

R645-301-300 Biology

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R645-301-300 Biology

R645-301-320 Environmental Description

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321.100 Plant Communities

A reference area, approximately one acre in size was selected in July 1983, encompassing pinyon-juniper-grass and riparian vegetation types (Plate 3-1). The reference area was selected on the basis of similarity with vegetation types which were believed to have occurred within the disturbed area before mining. This was done in conjunction with Mr. Lynn Kunzler of the Utah Division of Oil, Gas and Mining (DOGM).

In 1993, reference areas were selected for the Shower House Pad disturbance and the Tank Seam Access Road disturbance. The areas were selected in conjunction with Susan White of the D.O.G.M. These areas are also shown on Plate 3-1.

In 1996, a reference area was selected by Patrick Collins for the proposed Wild Horse Ridge disturbance. In 2001 he selected a reference area for the Wild Horse Ridge Tank Seam Pad area. These areas are shown on Plate 3-1. Plant communities and productivity was determined from these studies.

~~**OPERATION AND RECLAMATION PLAN**~~

~~**3.1 SCOPE**~~

~~This Chapter describes the action and procedures of Co-op Mining Company (Co-Op) to satisfy the requirements for underground mining operations and reclamation.~~

~~**3.2 SURFACE FACILITIES - EXISTING**~~

~~The mine which existed at the present site when mining began had been abandoned for over 30 years and subsequently there is no evidence of long existing facilities.~~

~~**3.3 SURFACE FACILITIES - NEW**~~

~~**3.3.1 Site Selection and Preparation of Proposed Facilities**~~

~~Plates 2-4 show the location of all surface facilities. In addition, the maps show an accurate determination of where each facility is in relation to the existing topography as well as structural fixtures such as highways and stream buffer zones.~~

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~~VEGETATION~~

~~SCOPE~~

~~A reference area, approximately one acre in size was selected in July 1983, encompassing pinyon-juniper-grass and riparian vegetation types (Plate 3-1). The reference area was selected on the basis of similarity with vegetation types which were believed to have occurred within the disturbed area before mining. This was done in conjunction with Mr. Lynn Kunzler of the Utah Division of Oil, Gas and Mining (DOGM). Further discussion with D.O.G.M has determined that there are better reference areas nearer to the mine site, therefore this area will no longer be used as a reference area.~~

~~In 1993, reference areas were selected for the Shower House Pad disturbance and the Tank Seam Access Road disturbance. The areas were selected in conjunction with Susan White of the D.O.G.M. These areas are also shown on Plate 3-1. The Shower House Pad reference area will also be used for the shop, sediment pond A, scale house, and coal storage areas. The tank Seam Access Road reference area will also be used for the mine access road.~~

~~In 1996, a reference area was selected by Patrick Collins for the proposed Wild Horse Ridge disturbance. In 2001 he selected an area for the Wild Horse Ridge Tank Seam Pad area. This area is shown on Plate 3-1.~~

METHODOLOGY

A reconnaissance-type survey was conducted within each vegetation type believed to have been disturbed, then correlated to reference areas in undisturbed areas. Quantitative sampling was conducted by Larry Germain and Paige Waldvogel, under contract with Mel Coonrod in August 1983. Additional species composition information was compiled in 1982 by the Soil Conservation Service (SCS). Specific efforts were made to locate and identify species proposed or listed as threatened or endangered, noxious weeds and selenium indicators.

Sample Point Selection

Ground cover and woody plant density data were collected on pinyon/juniper-grass and riparian portions of the reference area using a random sampling technique. The starting point of each 50 m transect was randomly selected using random numbers, generating bi-directional coordinates. Points were located in the field by pacing. Orientation of each transect was selected, using random generation of compass bearings.

Sample Adequacy Determination

Utah DOGM guidelines (1982) dictate the following sampling adequacy requirements for estimates of cover, shrub density and tree density:

1. Grasslands. 90 pct confidence, 10 pct precision

2. Shrublands and forests. 80 pct confidence, 10 pct precision

(Shrublands are defined as areas where shrubs contribute over 20 pct of the total cover.)

However, the guidelines require that a minimum number of samples be taken. The guidelines identify the maximum number of sampling adequacy is not met with fewer samples.

Vegetation Cover Estimation

Cover data was obtained at 50 pts, spaced at 1 m intervals along a transect at each randomly selected sample point. A liner point-frequency frame (Mueller-Dombois and Ellenberg 1974) was used to accurately measure vertical hits on vegetation, litter-rock and bare ground. Crown or shoot cover was measured by counting only the first interception of the pin with a plant part. Overhead canopy cover was determined by recording the plant species hit when the vertical line of the pin was protected upward above the frame. Where crowns overlap in layered vegetation, the uppermost layer was considered the primary vegetation hit and subsequent hits on lower vegetation was recorded separately.

This technique provides frequency information for vegetative, litter-rock and bare ground components of total cover along a given transect. Frequency of individual plant species encountered along each transect was also determined to provide relative distribution information.

Shrub Density and Height Estimation

Shrub density and height were estimated along the same transects used for cover data. The height, number and species of shrubs whose stems rise within 50 cm on either side of the 50 m transect was recorded. Shrub heights were measured and recorded by two classes: less than 1 ft and equal to or greater than 1 ft. All data was recorded on standard forms.

Tree Density and Basal Area Estimation

A total count of all trees within the reference area was done.

Additional Reference Areas

Similar methodologies were used in measuring the Shower House Pad Reference Area, the Tank Seam Access Road Reference Area, and the Wild Horse Ridge Reference Area. The exact methodologies are described in Appendix 3-C (Shower House Pad), Appendix 3-A (Tank Seam Access Road) and Appendix 3-F (Wild Horse Ridge). All of these surveys were conducted by Patrick Collins.

EXISTING RESOURCE

SCS Productivity Estimates

Productivity estimates and range condition for the reference were obtained from the local SCS Range Conservationist. (See Appendix 3-B.)

Sampling Methodology

Plant Cover: 38-50 m transects; using a ten point frame at every 10 m interval.

Shrub Density: 24-1 x 50 meter transects, counting all shrubs rooted within the sampling area.

Formula for Sample Adequacy:

$$\frac{s\,t}{(0.1)\,(x)} = \frac{s2\ t2}{[(0.1)\,(x)]\ 2} = \text{Number of Samples needed (n)}$$

where: t = 1.96 at 90 pct confidence (from t table)

s = standard deviation of sample

x = mean of sample

For Cover: (numbers from cover summary sheet)

$$\frac{(8.60)\,(1.96)}{(0.1)\,(28.52)} = \frac{16.856}{2.852} = 34.93$$

For Shrub Density: (numbers from Density Sheet)

$$\frac{(4.05)\,(1.96)}{(0.1)\,(19.13)} = \frac{7.938}{1.913} = 17.22$$

Example calculation for deriving pct vegetative composition:

Agsp $\frac{742}{38_{\text{transects}}} = 19.5$ $\frac{19.5}{*28.52} \times 100 = 68.37$ pct

all species' averages + bare ground + rock+ litter = 100 pct

*all species averages tataled = 28.52

Example calculation for percent shrub composition:

Chna $\frac{73}{24_{\text{transects}}} = 3.04$ $\frac{3.04}{*19.13} \times 100 = 15.89$ pct

* 19.13 derived by adding all species averages

Table 3-1 lists the vegetation types by total acres and acres of disturbance. Each type listed is described as follows:

Table 3-1 Vegetation Types

	Permit Area		Disturbed Area	
Vegetation Type	Acres	Disturbed	Drill Seeded	Hydro Seeded
Conifer	139.06	-0-	-0-	-0-
Grass	62.73	-0-	-0-	-0-
Riparian	7.46	1.0	-0-	1.0
Pinyon-Juniper	654.96	15.0	10.0	5.0
Sagebrush	4.3	-0-	-0-	-0-
Reclaimed	.65	-0-	-0-	.65
Bare	19.30	-0-	-0-	-0-
TOTAL	904.27	16.0	10.0	6.65

Conifer Vegetation Types

The conifer vegetation type (Plate 3-1) occurs on steep north and west-facing slopes such as at the bottoms of the lower cliffs and between the riparian type and the lower fringes of the PJ type. A mixture of conifer species such as Pinyon Pine Pinus edulis, White Fir Abies concolor, Douglas Fir Pseudotsuga menziesii, and Utah Juniper Juniperus osteosperma dominate the mature type. Primary under-story species are Bluebunch Wheatgrass Agropyron spicatum and Serviceberry Amelanchier alnifolia. Scattered Bristlecone Pine Pinus longaeva occurs throughout the small valleys and along the edges of cliffs in the conifer type. Lightning and fire scared trees are scattered throughout this type. Browsing and grazing by native or domestic herbivores appears to be light in this type.

Grass Vegetation Types

The grass vegetation type (Plate 3-1) occurs on the small knolls and benches of the upper slopes in the potential disturbed area as well as on ridge tops within the permit area. This type is dominated by Salina Wildrye Elymus salinus mixed with Bluebunch Wheatgrass Agropyron spicatum and Wild Bunchwheat Eriogonum corymbosum. Trees and shrubs common in the surrounding conifer type occasionally occur within the grass type but the overall appearance of the area is one dominated by grass species.

Riparian Vegetation Types

The riparian vegetation type (Plate 3-1) occurs as a narrow band in the moist bottoms of the canyons in the mine plan area. Although riparian species such as Narrowleaf Cottonwood Populous angustifolia and River Birch Betula occidentalis occur in the type, species such as White Fir Abies concolur and Douglas Fir Psuedotsuga menziesii, which are common in the surrounding conifer type, also dominate the riparian type. In some areas it is primarily the presence of the stream bottom and relatively robust growth form of the species that separate the riparian bottom from the surrounding conifer vegetation. Most of the vegetation cover in this type is provided by the trees. The under story in the riparian type consists of scattered shrubs such as Rocky Mountain Juniper Juniperus scopulorum and Woods Rose Rosa woodsii as well as a sparse cover of the grasses and forbs. Use of the riparian type by native and domestic herbivores appeared to be light.

Pinyon-Juniper Type

PJ habitats, prevalent on the south-facing slopes with rocky substrata of blocky sandstone, were extensive in the permit area (see Vegetation Map, Plate 3-1). Most PJ areas were dominated by open stands of the Pinyon Pine Pinus edulis, Rocky Mountain Juniper Juniperus scopulorum, and Utah Juniper Juniperus osteosperma, with large Curl-leaf Mountain Mahogany Cercocarpus ledifolius. In a few places, the conifers were essentially lacking, resulting in a Mountain Mahogany "woodland." Many of the Mountain Mahogany more closely resembled small trees than shrubs being over 3 m high and having a single large trunk near the ground. Scattered Ponderosa Pine Pinus ponderosa and Douglas Fir Pseudotsuga menziesii were

conspicuous in more mesic sites, especially valley bottoms, and Serviceberry Amelanchier spp,was occasionally present in significant numbers.

Prominent PJ understory species included Big Sagebrush Artemisia tridentata, Fringed Sage Artemisia frigida, Broom Snakeweed Xanthocephalum sarothrae, Salina Wildrye Elymus salinus, Indian Ricegrass Oryzopsis hymenoides, Skyrocket Gilia Gilia aggregata, and Gumweed Macheranthera grindelioides.

Sagebrush

The sparse distribution of the sagebrush habitat type appears to be controlled by exposure and moisture availability. The largest stands of sagebrush occur in the flat lower drainage of Bear Creek Canyon. This habitat type merges on both sides of the canyon bottom, with the PJ (See Vegetation Map, Plate 3-1).

Dominant vegetation species include Big Sagebrush Artemisia tridentat, Rubber Rabbitbrush Chrysothamnus nauseosus, Fringed Sage Artemisia frigida, Thistle Cirsium spp., Skyrocket Gilia Gilia aggregata, Plains Pricklypear Opuntia polyacantha, Cheatgrass Bromus tectorum, and Bluebunch Wheatgrass Agropyron spicatum.

Bare Cliffs and Talus

Vegetation is nonexistent or sparse and consists of a few grasses and forbs. Cliffs separate the Grassland vegetation type of the plateau from the more vegetated areas of the canyon bottoms.

Shower House Pad Vegetation

In 1994, Co-Op disturbed additional area for constructing a shower house and employee parking area. The baseline vegetation data is described in Appendix 3-C. Sampling was performed in the fall of 1992. A reference area for the Shower House pad is shown on Plate 3-1 and the reference area information is also included in Appendix 3-C.

Tank Seam Access Road Vegetation

In 1994, Co-Op constructed an access road to the Tank Seam. Construction of the Road is described in Appendix 3-H. The pre-disturbed vegetation data, sampled in the fall of 1992, is described in Appendix 3-D. A reference area was selected for the Tank Seam portal pad and access road, and is shown on Plate 3-1. Appendix 3-H contains sampling data from the reference area and a comparison to the pre-disturbed vegetation on the Tank Seam access road and portal pad is included in Appendix 3-D.

Wild Horse Ridge Vegetation

In 2001, Co-Op increased the disturbance to include access roads, portals and a conveyor corridor to access coal reserves in Wild Horse Ridge. The baseline vegetation data is described in Appendix 3-F. Sampling was performed in August of 1996. A reference area is shown on Plate 3-1, and sampling information for the reference area is included in Appendix 3-F. Production information was collected on the proposed disturbed area and reference area in August, 1999. This information will be included in Appendix 3-F.

Wild Horse Ridge Tank Seam Vegetation

The baseline data for the Wild Horse Ridge Tank Seam area is described in Appendix 3-G. Sampling was performed in August of 2001, a reference area is shown on Plate 3-1 and sampling information for the reference is included in Appendix 3-G.

C. W. Mining Company will assure that for the Tank Seam area there will be at least 1,000 plants per acre after reclamation, and that at least half of the woody plants (by number) will be comprised of Mountain Mahogany, Skunkbrush, and Vasey Big Sagebrush.

Federal lease U-61048 & U-61049

In 2004 & 2005 Mt. Nebo Scientific in cooperation with the Forest Service performed a vegetation survey of all areas on Gentry Mountain located within the permit area. The results of this study can be found on Plate 3-1.

Mohrland Vegetation

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A summary of the reference areas are presented in Table 3-2.

Table 3-2 Vegetation Reference Areas

Reference Areas	Reference Type
Shower House Pad	Grass-Pinyon-Shrub
Tank Seam Access Road Reference Area	Pinyon-Juniper-Grass-Mt. Mahogany
Wild Horse Ridge Reference Area	Pinyon-Grass-Conifer
Wild Horse Ridge Tank Seam Area	Grass-Conifer-Mt Mahogany

321.200 Productivity of Land

See R645-301-321-100

R645-301-322 Fish and Wildlife Information

The information in Appendices 3-I, 3-J, 3-K, and 3-L was developed to address Division of Oil, Gas and Mining requirements in conjunction with recommendations by the Division of Wildlife Resources.

FISH AND WILDLIFE RESOURCES

SCOPE

The purpose of this report is to inventory the wildlife resources in the Bear Canyon Mine permit Area and to evaluate the impact of the operation of the mine on those resources. The study includes birds, amphibians, reptiles, and mammals. Analysis entailed a review of the applicable literature, consultation with the relevant agencies, field analysis, and impact evaluation. Input and recommendations from the Utah Division of Wildlife Resources (UDWR) can be found in Appendixes 3-I and 3-J.

In sum, this study uncovers min impact on wildlife from continued operation of the mine. Since the Bear Canyon Mine has been worked intermittently since 1896, the ecosystem has already stabilized to some degree with mining.

METHODOLOGY

Aquatic Resources

Bear Creek is the only water within the permit area that is perenial (class 3A). Runoff from the permit area flows into the Bear Creek and the Huntington Creek drainages. These are the only drainage which could potentially be affected by Co-Op's mining activities and the potential impact is expected to be insignificant. A discussion of the potential impacts can be found in Section 9 of Appendix 7-J.

The aquatic resource description of Bear Creek consists of a review of available information from previous surveys. Surveys have been conducted of both Bear and Huntington Creek although the potential for impact is considered to be minimal. Water quality determinations have been conducted by certified laboratories to establish baseline data and routine monitoring will continue as outlined in Chapter 7 on all surface and ground water within the permit area.

Terrestrial Resources

This research was designed to qualitatively evaluate the terrestrial vertebrate components in habitats which may be affected by the proposed expansion of the Bear Canyon mine. The following methodologies were used:

a. Conduct a literature review and detailed analysis of UDWR plan for the Bear Canyon Mine project and geographic area of concern.

A thorough literature review was conducted. The libraries at each of the major universities in Utah were surveyed. Special emphasis was given to location of published literature pertinent to the geographic area and habitat types in question. In addition, surrounding mine plans were reviewed for pertinent data.

Visits were also made to state and federal agencies that have jurisdiction or control over the study areas. All pertinent reports and management plans were reviewed, and appropriate personnel were questioned.

b. Contact the regulatory authorities to determine what wildlife information might be required.

The regulatory authorities were contacted by mail, phone, or personal visit to determine what wildlife information would be required.

c. Identify and cursorily inventory the terrestrial vertebrates by species for each of the habitats in the area of potential impact. Determine migratory utilization of the habitats.

Literature analysis and field observations were conducted to determine the probable and actual inhabitants of the area of potential impact and to identify habitats significant to their presence and/or persistence.

d. Categorize the status of each species and highlight those that deserve special attention because they are endangered or threatened or of economic or recreational value.

The methods and procedures essential to the accomplishment of this objective involved basically two things. First, all of the species observed or known to inhabit the potential areas of impact were identified to species through objectives a and d and listed phylogenetically in tabular form. Second, all species were categorized by: 1. habitat, 2. relative abundance, 3. resident species, 4. seasonal use, and/or 5. high interest species. The term "high interest species" designates those animals that require special attention by scientists and/or public management agencies because they are either endangered, threatened, protected game, or of economic or recreational value. The reasons for this high interest designation include: 1. ranges are small, thus restricting population to perhaps a few, 2. although populations may be numerically large, ranges

may be small within the entire represented area, 3. irrespective of population numbers or range, little is known of the current status and in some cases information suggests that populations are declining, 4. species are sensitive to impact and may be in danger of abnormal declines, 5. species are relict or may have aesthetic or scientific value, 6. economic or recreational importance, and 7. combinations of the above.

e. Evaluate and discuss in the report from the significant interactions on the terrestrial vertebrates present. High interest species are to be highlighted.

This objective is satisfied by discussions of the significant habitats, interactions, and potential results of the impacts on the terrestrial vertebrates. Appendix A outlines the procedures adopted by Co-Op as recommended by UDWR.

EXISTING WILDLIFE RESOURCES

Wildlife Habitat in the Mine Plan Area

The area of potential impact is covered by several important habitats that are used by species considered of "high interest" to various management agencies because of economic or recreation value. There are five major vegetation habitats from a faunal standpoint: pinyon-juniper, sagebrush, conifer, grass, and riparian.

Mine Site Location. This area is approximately 16 acres and is one area where surface construction will occur. It is covered primarily with pinyon and juniper trees, sagebrush, and rabbitbrush, with spruce trees in some of the side canyons. Basically it is a high, dry, desert environment.

Haul Road and Utility Corridors. Haul road and Utility corridors are both described as having the same general habitat as the Mine site with the addition of a narrow band of riparian habitat along Bear Creek.

Wildlife

Aquatic Wildlife Habitat and Value Determination

The only perennial stream's that runs through the Bear Canyon Mine permit area ~~is~~ are Bear Creek and Fish Creek. Only the upper portion of Fish Creek flows through the permit area containing an average of 10gpm during the fall.

Bear Creek is a low-quality aquatic environment of little value to the aquatic resources of the area. A biological community most likely occurs in Bear Creek on an intermittent basis. Being present during a portion of those years when runoff is exceptionally high followed by wetter than usual summer and fall precipitation.

Even if the mine was removed, natural conditions would be stressful to aquatic life. Huntington Creek does receive runoff and/or groundwater from the permit area at some times during the yr, but because of Bear Canyon stream's quality, impact from mining will be minimal. All drainage from disturbed areas is passed through sedimentation ponds before discharge, reducing impact potential further.

Terrestrial Wildlife Habitat and Value Determination

Literature and field data were summarized for all terrestrial vertebrates of concern, the species status, and potential perturbation. Appendix 3-K list all of the vertebrate species of southeastern Utah according to their various ecological classification. All species whose ranges appear to overlap any or all of the potential area of impact are listed.

The permit area could potentially be inhabited by 239 species of vertebrate wildlife as detailed in Appendix 3-I and 3-J. Some of these are considered high interest species for the habitats and local area of concern. High interest wildlife are defined as all game species, any economically important species, and any species of special aesthetic, scientific or educational significance. This included all federally listed threatened and endangered species of wildlife. UDWR has determined that the permit area is of critical value for the elk and mule deer.

Mammals

The area of potential impact is likely to be inhabited by 84 species of mammals. The names of these animals and their habitat affinities are listed in Appendix 3-I and 3-J. They represent 6 orders and 15 families of mammals. Twenty-five species are considered high-interest species, 14 of which are protected by state or federal code. The conifer and high elev mountain grass areas near the Northern extreme of the permit area are used as summer range and fawning areas for mule deer. They are also utilized by cougar, bobcat, and possibly bear.

The low elev mountain grass and pinyon-juniper habitats in the foothills just above the Mine are utilized by elk, during winter and spring. The same area is used during spring, summer, fall and, as indicated by fallen antlers, during winter by a few of the larger deer. However, the major winter area for mule deer is in the pinyon-juniper and sagebrush habitats, along the lower hills and the entire foothill area. In all habitats, water is a critical resource and is possibly the limiting factor. The high interest species will be discussed individually in Section

322.220 of this report. It is doubtful that proposed expansions will seriously impact the other species since no new surface disturbances are planned.

Birds

One species of involved birds is~~are~~ on the ~~endangered~~ sensitive species list: the peregrine falcon (thought to be a year-round resident in southeastern Utah). ~~However, there are no known nesting sites for the peregrine falcon in this area. Because of the suspected transient nature or these birds, no problems are foreseen with the projected development. A Raptor survey was made during 1987 to confirm these assumptions~~. The Northern goshawk and the golden eagle are Management Indicator Species. The Northern goshawk has not been found in the permit area. Golden eagles are found within the permit area. Both the golden eagle and the peregrine falcon are included in the raptor surveys performed by C. W. Mining Company. Raptor surveys will be performed yearly during the life of the mine. The results of these surveys are included in appendix 3-L. Potential areas of impact are shown on Plate 5-3A. The areas designated for potential impact include the mine site location, ~~and~~ the haul road and utility corridor, and areas of potential escarpment failure. Migratory birds covered by E.O. 13186 may pass through the area.

The more important bird species of the area are listed in Appendix 3-K.

Amphibians and Reptiles

The material used in this portion of the report was derived from literature and a discussion with Dr. W. W. Tanner (retired) an internationally known herpetologist specializing in the reptiles and amphibians of Utah.

Increasing elev rapidly reduces the number and kind of reptiles and amphibians. In Utah, the more northern latitude reduces numbers of reptiles and amphibians in much the same way as does the increase in elev.

The geographical and associated climatic factors have eliminated most desert species, leaving species that are adapted either to mountain habitats or mountain type habitats developed in the more northern areas. Thus, the reptiles and amphibians of Utah, and particularly those inhabiting the areas under the consideration, have arrived in Utah by means of dispersal lanes coming from the northeast and the southeast. With few exceptions, the species listed have wide distribution and are versatile in their adaptive abilities.

Literature pertaining to the amphibians and reptiles is extensive, but much of it refers to species occurring in the desert areas and has only limited reference to forms inhabiting high elev in Utah. Most of the publication dealing with species lists for the state are old.

The most up-to-date listing for the area under consideration may well be a checklist of Utah amphibians and reptiles (Tanner, 1975), and Utah Division Publication No. 78-16 (Dalton, 1978) (Appendix 3-K) which references a contiguous and similar geographic area.

Amphibians. Based on the literature review, it was determined that probably six species of amphibians inhabit the proposed area of concern which provides substantial value habitat for the three species listed, the Great Plains Toad, Great Basin Spadefoot, Woodhouse's Toad, . All amphibians are legally protected in Utah, but since the species listed are all widespread throughout similar habitats in Utah, none are treated as high interest species, and therefore, are not individually discussed.

Reptiles. Based on a review of the literature, it was determined that probably 18 species of reptiles occupy the expansion area; this area is considered to be a substantial value habitat for all species. All reptiles have some protection under the Utah code, but since the species listed are all widespread throughout similar habitats in Utah, none are treated as high interest species and, therefore, are not individually discussed.

Appendix 3-I contains a more detailed discussion of amphibian and reptile species.

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[1]V. Tanner, Amphibians, 1931; Woobury, Reptiles, 1931, and Pack, Snakes, 1930

[2]Other recent literature pertinent to this report are: Schmidt (1953); Stebbins (1954 and 1966); W. Tanner (1953, 1957 a and b, 1966 with Banta, 1969 with Morris and 1972 with Fisher and Willis); and Woodbury (1952).

Listed or Proposed Endangered or Protected Species of Plants and Animals

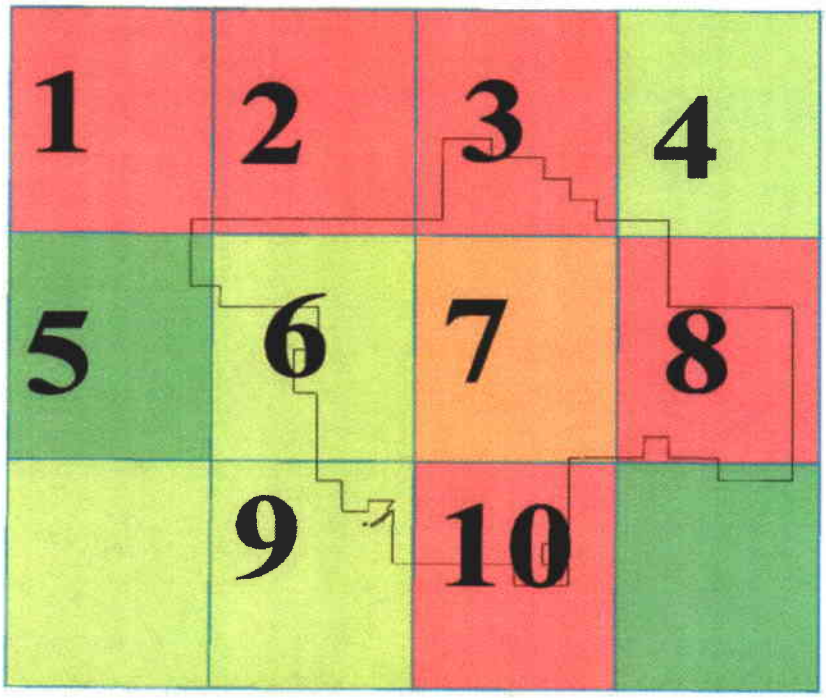
The County Lists of Utah's Federally Listed Threatened(T), Endangered(E), and Candidate(C) Species published September 25, 2006 by the Utah Division of Wildlife Resources (DWR) is shown below.

Common Name	Scientific name	Status
Jones Cycladenia	Cycladenia humilis var jonesii	T
Maguire Daisy	Erigeron maguire	T
Last Chance Townsendia	Townsendia aprica	T
Barneby Reed-mustard	Schoenocrambe barnebyi	E
San Rafael Cactus	Pediocactus despainii	E
Winkler Pincushion Cactus	Pediocactus winkleri	T
Wright Fishook Cactus	Sclerocactus srightiae	E
Humpback Chub	Gila cypha	E
Bonytail	Gila elegans	E
Colorado Pikeminnow	Ptychocheilus lucius	E
Razorback Sucker	Xyrauchen texanus	E
Bald Eagle – Breeding	Haliaeetus leucocephalus	T
Yellow-billed Cuckoo – Possibly	Coccyzus americanus	T
Mexican Spotted Owl	Strix occidentalis lucida	T
Southwestern Willow Flycatcher	Empidonax traillii extimus	E

A map showing blocks with lists of Utah sensitive species was also downloaded from DWR's web page. (See figure 3-1)

In 2004 C. W. Mining meet with DWR and based on this map it was determined that due to elevation the only possible species of concern for the permit area was the Townsend's Big-eared Bat. DWR also stated that they anticipated the addition of the Flamulated Owl to the threatened and endangered species list in the near future, and that it may also be a species of concern.

In order to address these concerns C. W. Mining conducted a bat and owl survey and determined that neither of these species were located in the permit area. The results of this survey can be found in Appendix 3-M



See T&E Specieas List

Figure 3-1 Utah Threatened, Endangered, and Sensitive ~~Mammalian Endangered~~ Species in Relation to Permit Area

(created by the Utah Division of Wildlife Resources May 3, 2006)

T & E Species List

Block 1

Bald Eagle (Haliaeetus leucocephalus)

Block 2

Northern Goshawk (Accipiter gentilis)
Greater Sage-grouse (Centrocercus urophasianus)
Canada Lynx (Lynx canadensis)

Block 3

American Three Toed Woodpecker (Picoides dorsalis)
Townsend's Big-eared Bat (Corynorhinus townsendii)
Greater Sage-grouse (Centrocercus urophasianus)
Canada Lynx (Lynx canadensis)

Block 4

Western Toad (Bufo boreas)
Ferruginous Hawk (Buteo Regalis)

Block 5

Bonneville Cutthroat Trout (Oncorhynchus clarkii utah)
Columbia Spotted Frog (Rana luteiventris)
Western Toad (Bufo boreas)

Block 6

Northern Goshawk (Accipiter gentilis)
Greater Sage-grouse (Centrocercus urophasianus)
Canada Lynx (Lynx canadensis)

Block 7

Northern Goshawk (Accipiter gentilis)
Greater Sage-grouse (Centrocercus urophasianus)

Block 8

Ferruginous Hawk (Buteo Regalis)

Block 9

Greater Sage-grouse (Centrocercus urophasianus)

Block 10

Wright Fishhook Cactus (sclerocactus wrightiae)
Winkler's Pincushion Cactus (Pediocactus winkleri)
Bluehead Sucker (Catostomus discobolus)
Black-footed Ferret (Mustela nigripes)
Bald Eagle (Haliaeetus leucocephalus)
Greater Sage-grouse (Centrocercus urophasianus)

There are no endangered or threatened species of mammals in the mine plan area, nor are there any in proximity close enough to be considered ~~(Figure 3-1)~~. Co-Op is committed to notify the Division in the event any T & E species were observed on the permit area, as well as any critical habitat.

Official U.S. Fish and Wildlife Service Section 7 opinions relating to the aquatic resources of Huntington and Eccles Canyon drainages have indicated that no threatened or endangered species of fish or other aquatic organisms have been found in waters upstream of the lowest 2 or 3 mi of the Price or San Rafael rivers. The organisms of Trail Creek, as presently known, are all common and widely distributed throughout streams of Utah. The aquatic organisms of Bear Creek have representatives of several taxonomic classifications that are limited to low quality environs, but none, as far as is presently known, are rare in the inter-mountain region.

~~One~~Several species of ~~endangered~~sensitive raptors~~, the peregrine falcon,~~ may be found in the mine plan area. Known raptor nest sites within the permit area are shown in Appendix 3-L and on Plate 5-3A,. ~~according to a survey conducted by the Raptor Biologist from the U.S. Fish and Wildlife Service.~~

According to the Utah Division of Wildlife Resources report, there are ~~forty-six~~fifty-eight current or old raptor nest locations within or near the permit area. The location of the nests are shown on Plate 5-3A and a description of them and of the raptor surveys is in Appendix 3-L.

No plant species listed as threatened or endangered (U.S. Fish and Wildlife Service, 1982) or proposed for threatened or endangered status (Welsh and Thorne, 1979) was observed on the study area. No plants listed as threatened or endangered are known to occur in the Co-Op permit area (Thompson, personal communication, 1983). The U.S.D.A. Forest Service identified no threatened or endangered plants in their correspondence dated 29 Jan 1991 (Appendix 3-B). A survey on November 4, 1993 by Robert M. Thompson, USFS Botanist, revealed no threatened or endangered species within the proposed road extension area for the Tank Seam (letter, Appendix 3-B).

A sensitive species, Canyon Sweetvetch (*Hedysarum Occidental* Var *Canone*), was identified within and adjacent to the Bear Canyon disturbed area. Populations were found to be high, especially in the areas on Federal Lease U-024316. Information on this species is presented in Appendix 3-E. Locations of these plants are shown on Plate 3-1 and 3E-1. And is discussed in Appendix 3-F, populations were also observed within portions of the proposed Wild Horse Ridge disturbed area, and in the lower portion of Fish Creek outside the permit boundary. Where these plants are located, Co-Op will avoid disturbing them to the extent possible during and subsequent to construction.

In order to re-establish the species in this area upon final reclamation, the topsoil stockpile will be seeded with the species to establish a community on the stockpile. This seed will be obtained from the Canyon Sweetvetch communities located in upper Bear Creek, shown on Plate 3E-1. During the season prior to final reclamation, seed will be harvested from the community established on the topsoil pile, as well as from the other communities within Bear

Canyon. These seeds will be incorporated into the seed mix during seeding following the topsoil redistribution.

Link Trail Columbine (*Aquilegia flavescens Var. rubicunda*) also classified as a sensitive species, has been found in three locations in Bear Canyon. The first location is in the vicinity of Big Bear Spring. The second location is in the riparian area of the right fork of Bear Canyon, located below spring SBC-14 near the Wild Horse Ridge Coal Storage Bin. The third site is at the confluence of Bear Creek and the right fork of Bear Creek. The third location is the only sight proposed to be disturbed, where two specimens were~~are~~ observed. The plant was also found in the lower portions of Fish Creek below the permit boundary. Where these plants are located, Co-Op will avoid disturbing them to the extent possible during and subsequent to construction.

322.220 Habitats and Areas of High Value

~~These areas are shown on Plate 3-2~~. The main areas of high value for vegetation are the riparian areas around springs and streams. These areas extend approximately 0-100 ft. from the spring sources. They also occur intermittently along a 30 ft. corridor in the right fork of Fish Creek starting at a point 1,637 ft. west and 1,151 south of the northeast corner of section 18 T16S R8E, and extending past the permit boundary.

Due to the depth of overburden no impact to these areas are expected. Since these area are dependent on the springs and streams within them any impacts to them will be the result of loss of water flow. The water monitoring plan outlined in Chapter 7 will catch any impacts to the water flow. If an impact is noticed the land owner and the Division will be consulted and a site specific mitigation plan will be developed. A detailed discussion of subsidence impacts and protection methods is included in Appendix 5C.

Areas of high value for wildlife include deer and elk calving, fawning, and grazing areas, as well as areas of habitat for Black Bears, Bobcats, and Mountain Lions. All information available on these areas are shown on Plates 3-2, 3-3, 3-4, and 3-5. A more detailed discussion of habitats and areas of high value can be found in Appendix 3-I. Appendix 3-K includes a mitigation plan addressing possible impacts to wildlife.

R645-301-323 Maps and Aerial Photographs

323.100 Vegetation Reference Areas

The location of reference areas for determining the success of revegetation can be found on Plate 3-1.

323.200 Monitoring Stations

Not Applicable

323.300 Protection Facilities

Not Applicable

323.400 Plant Communities and Sample Locations

Vegetation areas of the mine plan site have been mapped and placed in the permit. This information can be found on Plate 3-1.

R645-301-330 Operation Plan

R645-301-331 Intrim Reclamation Plan

SCOPE

The following procedures are deigned to revegetate and control erosion. They will to a large degree satisfy the commitments made by the Co-Op in their permit wile also satisfying OSM regulations as pertaining to wildlife concerns and interim reclamation for those areas which will be utilized during mining operations.

Actual procedures involve a three phase program:

1. Earth work to prepare the site to be stable enough for a period of time to allow vegetation to become established.

2. Hydro-seed Mulch the entire area to supplement revegetation and control runoff until stabilization is complete.

3. Vegetation Monitoring will be continued on each site for 5 years or until vegetation standards have been met. Reseeding will be completed if required.

The operator will notify the division two weeks prior to all seeding work (interim or permanent), to allow the Division to be on site when the work is done.

METHODOLOGY

Phase 1 – Earth Moving

The pad down slopes will be brought back to a reasonable configuration by implementation of a crawler tractor. The actual method will involve smooth contouring of the existing soil and walking the crawler up and down the slope attempting to minimize compaction while at the same time creating small indentations by the grouser on the track. This methodology creates an enhanced micro-climate for the establishment of seed and guarantees sufficient compaction as to assure integrity and stability of embankment and prohibit failure.

Phase 2 – Seeding and Mulching

The entire disturbed area will be drilled or broadcast seeded (including hydro-seeding) during the mid fall season with a target completion date of 15 October. The seed mix and rate of application for interim reclamation is shown in Table 3-3. Hydro-seeding and mulching will be carried out in conjunction with the earth work of Phase 1. All Hydro-seed or hand seeded areas will be lightly raked to insure adequate soil/seed contact. Recommendations for the hydro-seeding and mulching operation are shown in Table 3-7.

Table 3-3 Recommended Seed Mix for Interim Reclamation

Species	Lbs/Acre PLS Hydorseed
Grasses	
Agropyron dasystachyum Thickspike wheatgrass	6.6
Agropyron spicatum Bluebunch Wheatgrass	8.7
Elymus cinerus Great Basin Wildrye	1.7
Oryzopsis hymenoides Indian Ricegrass	3.3
Poa secunda Sandberg Bluegrass	2.2
Cover Crop	
Avena sativa Oats	20

All seed obtained will comply with all state and federal seed laws. Copies of certificates for testing and poundage of seed purchased, will be submitted to the division.

Phase 3 – Monitoring

All interim seeded areas will be inspected at the end of each growing season to determine the success of the seeding program for a period of at least five years (reclamation years 1-5). Where success is not apparent, as represented by achievement of 80 pct original cover during the 5-year period, monitoring will be immediately investigated to determine the possible failure cause(s), so that positive steps can be taken to establish the desired interim vegetation during the next seasonal opportunity. The success of the interim seed mixture will be evaluated and areas that do not meet the success criteria will be reseeded. This effort will ensure a temporary cover of small grains, grasses or legumes until a permanent cover can be established.

Ocular estimates will be made to determine the degree of success for interim revegetation attempts.

R645-301-332 Subsidence Impacts and Mitigation

All subsidence will be monitored as shown on Plate 5-1. A detailed description of C. W. Mining Company's subsidence monitoring plan is included in Appendic 5C.

R645-301-333 Plant, Fish and Wildlife Impact Avoidance Plan

Protection of Vegetative Resources

Co-Op has maintained a commitment to reclaim the unused disturbed areas to the extent of the cover of the natural vegetation on the mine plan area. In areas above retreat mining no impacts to vegetation are expected. If vegetation is impacted a mitigation plan will be developed with input from the land owner and the Division of Oil, Gas, and Mining.

Projected Impacts of Mining on Vegetative Resources

Since the Bear Canyon Mine is an underground mine, the overall impact on surface vegetation is minor. The effects of surface operations on vegetation from new construction are on-site erosion and reduction of desirable plant species which reduce forage production and wildlife capacity.

Vegetated areas adjacent to the disturbed areas are protected from coal fines primarily by utilization of dust controls, such as water sprays on the coal handling facilities and watering of the coal haul roads. One of the major areas that indicates collection of coal fines, is located in the canyon below the Upper Storage Pad. However, the actual impact has not been determined.

In order to eliminate the potential of coal fines migrating to surface waters, this area was added into the disturbed area boundary in 1992. Runoff will be directed to sediment ponds, see R645-301-742.300. Areas in Bear Canyon surrounding the mine site will be routinely monitored and additional preventative and/or control actions will be taken if additional affected areas are identified.

Waste dumping or other disturbance on undisturbed areas is not permitted. Disturbed area perimeter markers delineate the boundaries of disturbance. Employees are trained not to dump or otherwise disturb areas outside those boundaries.

Renewable vegetative resources exist within the wild Horse Ridge subsidence zone in the form of timber and grasslands which are used for grazing. As discussed in Appendix ~~3~~5-C, minimal detectable subsidence is expected on the surface. Past experience has shown that tension fractures which result from subsidence are localized and minimal, so these resources should not be impacted. Further discussion is contained in Appendix ~~3~~5-C.

Mitigating Measures to be Employed to Reduce Impacts on Vegetative Resources

All recontoured areas will be planted and revegetated during the first appropriate season following grading and redistribution of topsoil. This program will include any necessary addition of remedial treatments to the soil. A suitable, permanent and diverse vegetative cover has been selected on the basis of appropriate land management agency requirements and will be established on all reclaimed areas. The schedule of the program is presented in R645-301-

542.100. What follows is an outline of the major aspects of the revegetation plan. The specific measures involved will be addressed on a site specific basis.

Seeding and Planting. All plants used to revegetate the disturbed areas will be native or compatible species selected specifically for the vegetative community. Seed types may include wheatgrass, salina wildrye, sagebrush, pinyon and juniper and are listed in R645-301-340. Wherever possible, seed will be drilled or disked into the ground. In steep slope areas, where such techniques are difficult or impossible, hydro-seedings or cyclone spreader seeding will be done.

Native shrubs will be used for shrub replanting. These will be potted seedlings, if available. Bare-root trees will be used to some extent. Seedling will be planted during the months of April-May when possible. However, depending on availability, fall planting would occur September-October.

Mulching and Moisture Retention. All regraded and topsoiled areas will be mulched or otherwise treated to promote germination of seeds and to retain moisture. Various moisture-retention products are available and are detailed in the specific reclamation plan in R645-301-340.

Maintenance. Should such procedures prove necessary to the success of the revegetation plan, protection of replanted areas from animals may be carried out. Such procedures however, are

unlikely to be needed because the species to be selected should not require continuous or considerable maintenance beyond replanting.

Vegetation Monitoring Procedures

Qualitative observations of revegetated areas will be made yearly throughout the ten year liability period (See R645-301-250). Quantitative measurements of reclamation will be collected during years 2, 3, 5, 9 and 10 of the same bond liability period. Any areas not achieving success will be re-evaluated and revegetated as needed.

Protection of Fish and Wildlife

Wildlife is present in the mine plan permit area. Due to the size of the total disturbance impacts on the various mammal, amphibian and reptile species should be minimal. In addition, Co-Op is committed to mitigating as much as possible the adverse effects of all new construction and maintaining the natural abundance and diversity of the area.

Projected Impacts of Mining on Fish and Wildlife

Mammals. The Bear Canyon Mine plan area is inhabited by 74 species of mammals, of which 25 species are considered of high interest and 14 of these are protected by state or federal law.

Elk that are thought by the Utah Division of Wildlife Resources (UDWR) to be stable and productive use portions of the mine plan area at various times of the year for such necessary activities as wintering and feeding. This use, however, is marginal and not crucial. The minimal disturbance caused by planned surface facilities will have no significant impact on the herd.

Mule deer utilize the whole permit area, taking advantage of various habitat at different times of the year. Browse in the wintering range within the permit area is in good shape and should facilitate over-wintering of the herd. Projected impact from proposed surface operations is expected to be minimal. The range of cougars in the permit area is determined by the migration patterns of mule deer and by human disturbance. Since the cougar population is low and since their range is far greater than the areas of proposed construction, mining activities will have little impact on the species.

Black bear may inhabit the permit area but the area is small compared to the overall habitat area. Black bears are not numerous, nor are they likely to be disturbed during the most sensitive times of their annual cycle. Impact will be minor at most.

Cottontail rabbits are likely to be affected only by subsidence, which will be limited to relatively small areas thus causing little impact. Disturbance to vegetation resulting in several succession will actually improve the reproduction potential of the rabbits.

Impact on snowshoe hares will be minor since the species habitat in conifer-aspen stands is limited in the permit area.

Furbearers using underground burrows may be affected by subsidence within limited portions of the permit area. However, such effects will be temporary and the species are widespread and adaptable to human activity. Long-term impacts will be minimal. Mining activity will have little effect on the habitat of small mammals. Subsidence damage to burrows could increase mortality and reduce reproductive success temporarily, but the effect would be temporary because of the continued survival of the breeding population in contiguous areas and to the high densities of these species.

Birds. ~~species list: Only one species found in the vicinity of the mine permit area is on the endangeredThe peregrine falcon is not known to nest within the permit area.~~Several sensitive species may be present. The Golden Eagle is found on escarpments in and around the permit boundary which is a USFS Management Indicator Species.

Potential impact on bird species would be escarpment failure and loss of riparian habitats. No loss of riparian habitat is expected. Escarpment failure and protection of escarpments and riparian areas inside the affected area are discussed in Appendix 5C.~~limited to the proposed new construction areas. Impacts, however, should be minor since the areas involved are small and since equivalent habitat is readily available close by~~. (See Raptor Survey UDWR -- Appendix 3-I).

~~Prior to construction of surface facilities, Co-Op will work with the UDWR in developing a mitigation plan for potential impacts to raptor nest utilization in the vicinity of Wild Horse Ridge.~~

Amphibians. The three amphibians occurring in the permit area occupy similar habitats throughout the region and are unlikely to be affected in any major way by planned activities.

Reptiles. Reptiles found in the permit area are located in many other similar habitats and their populations will not be seriously impacted by planned activities. UDWR personnel will be notified if any denning sites are discovered during mining or construction.

Aquatic Wildlife. Since there are no high quality streams in the surface operation areas, little impact to aquatic wildlife is expected. Huntington Creek, the closest high quality stream to the permit boundary, is located a considerable distance from the surface operation, 1.5 miles. This high quality fishery is protected through Co-Op's Sediment Control Structures (R645-301-742.300).

Lease Areas

In most areas above mining no substantial impact is expected due to the depth of cover.

The possible impacts to the areas of high value is the formation of subsidence cracks. If this happens it will be mitigated as described in R645-301-358.

Another area of concern is along the escarpments. The primary concern is loss of raptor nests due to escarpment failure. Other concerns are impacts to sensitive plants, sedimentation, other wildlife, and visuals. These impacts will be mitigated as described in R645-301-358. Escarpment failure and these impacts are discussed in more detail in Appendix 5C and in Section 9 (PHC) of Appendix 7J.

Mitigating Measures to be Employed to Protect Fish and Wildlife

Maximum effort will be made to minimize habitat disturbance and loss. Surface activity will be minimal. Construction will be scheduled to minimize conflict with deer and elk use periods.

The disturbed areas will be reseeded within the next growing season and the resulting seral succession will actually benefit deer and elk. Habitat loss due to construction in limited to the size of the disturbed area and will be small. All water in the permit area is perennial, but of poor quality. Any water sources necessary to wildlife will be provided. in addition, riparian habitat will be enhanced. Structures that pose a barrier of hazard will be provided with passageways, buffers, fences, or other necessary protection, as directed by UDWR (Appendix 3-J). Co-Op is committed to reclaim all disturbed land and remove all support facilities in

accordance with R645-301-540 upon completion of mining to prevent damage to fish, wildlife and related environmental values.

The applicant will inform employees of the vulnerability of local wildlife and will admonish them to avoid all harassment or unnecessary activity. In addition the training film offered by the UDWR "Coal Mining and Wildlife" will be shown annually to all employees.

Any discovered wildlife impact not described here will be mitigated by Co-Op with methods agreed upon by UDWR. Co-Op will also report the presence of all Golden Eagles on the permit area as well as any T&E species.

Since no impacts are expected to surface waters of mine area in the near future, no special mitigation plan concerning Bear Creek is presented here.

Wildlife Monitoring Procedures

Bear Creek does not warrant a biological or habitat monitoring effort in the area of the mine lands. Deer and rodent use of areas planted with tree and shrub species will be observed yearly. If heavy use of the planted trees and shrubs by deer appears probable, appropriate protection measures will be taken. Also, should significant rodent damage become likely, a control program may be developed in conjunction with UDWR and appropriate land management agencies.

R645-301-340 Reclamation Plan

R645-301-341 Revegetation

The following procedures are designed to revegetate and control erosion. They should satisfy the commitments made by Co-Op towards post mining land use while also satisfying State and Federal regulations. A proposed revegetation schedule is given in Table 3-4.

The operator will submit a detailed revegetation plan in the last Five-Year Permit renewal prior to reclamation. The plan will include detailed map(s) of sufficient scale to show exact areas and methods of revegetation (i.e., drill seeding, terraces, netting, etc..) based on the best available technology and final mine site conditions. The operator will notify the division two weeks prior to all seeding work (interim or permanent), to allow the Division to be on site when the work is done.

The actual ground involved in reclamation procedures is identified in R645-301-240, and Table 1-4. The actual procedures involve a four phase program; (1) backfilling and grading, (2) prepare a site which will be stable enough for a period of time to allow vegetation to become established, (3) seed and mulch the entire area to supplement revegetation and control run-off until stabilization is complete, and (4) plant seedlings to further stabilize the soil and to provide necessary wildlife, hydrological and aesthetic commitments as detailed in mine reclamation permit.

Revegetation Timetable

Table 3-4 Revegetation Schedule

Task	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
						MONTH				
Review revegetation Plan	XX	X								
Order Seed		X								
Order Transplants			X							
Regrading					XXX	XXXX				
Spread Topsoil							XXX			
Seedbed Preparation							XX	X		
Apply Fertilizer								XX	X*	
Seeding								XX	X	
Mulching								XX	X	

Task to be done in subsequent years:

Plant Seedlings[1]	XX	X								
Monitor revegetation				XX	XXXX	XXX**		X***		
Submit Monitoring Report	X****									

* May need application of N the spring following seeding.

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

*** For survival of transplants.

[1] Plant transplants the spring within two yrs following seeding.

Seed Mix and Application Rate

All seed obtained will comply with all state and federal seed laws. Copies of certificates for testing and poundage of seed purchased, will be submitted to the division. Any changes in the approved seed mixes will first be cleared with the Division. Costs listed below were gathered from suppliers in Nov. 1990.

It is currently recommended by the State of Utah, Division of Oil, Gas & Mining (DOGM) that riparian areas such as the one in Bear Canyon Mine site not be seeded with a specific Riparian seed mixture. It is often impractical to attempt to seed these narrow corridors in conjunction with the surrounding seeded areas with a separate seed mix. Instead it is recommended that the operator seed the riparian area with the Pinyon Juniper Grass seed mix and augment with woody plant seedlings.

Co-Op proposes to seed the disturbed areas corresponding to all four reference areas with the seed mix shown in Table 3-6.

Table 3-5 Recommended Seed Mix, Riparian-Creek Bottom

Scientific Name	Common Name	Plants/ac
Populus angustifolia	Cottonwood	150
Prunus virginiana	Chokecherry	150
Rosa woodsii	Wood's Rose	100
Sambucus caerulea	Elderberry	100
Salix spp.	Willow *	
	TOTAL	750

* Salix should be cut from a source area in close proximity to the mine site and planted in the reclaimed area. In areas of suitable habitat Salix will be planted with at least one cutting every foot.

Table 3-6 Recommended Seed Mix, Pinyon-Junipor-Grass

Scientific Name	Common Name	PLS lbs/ac*
SHRUBS		
Artemisia tridentata	Big sagebrush (Vasey)	0.2
Artemisia ludoviciana	Prairie sage	0.2
Cercocarpus ledifolius	Mtn. Mahogany	1.0 ****
Rhus trilobata	Skunkbush	1.0
Amelanchier utahensis	Utah serviceberry	1.0
FORBS		
Achillea millifolium	Yarrow	0.1
Aster glaucodes	Blueleaf aster	0.2
Hedysarum boreale	Northern sweetvetch	1.5
Linum lewsii	Lewis flax	0.5
Penstemon eatonii	Firecracker penstemon	.5
Pentstemon palmeri	Palmer's Pentstemon	0.5
**Hedysarum Occidentals Var. Canone	Canyon Sweetvetch	See below
GRASSES		
Elymus cinereus	Gt. Basin Wildrye	3.0
Poa secunda	Sandberg's bluegrass	0.4
Elymus smithii	Western Wheatgrass	3.0
Elymus spicatus	Bluebunch Wheatgrass	3.0
Stipa hymenoides	Indian Ricegrass	2.0
*** Elymus salinus	Salina wildrye	2.0
	TOTAL	

* Rates based on broadcast seeding.

** Canyon Sweetvetch will be added, as available, to the seed used on the Wild Horse Ridge.

*** If unavailable no substitution required.

****Also to be transplanted as container grown plants in fall at the rate of 500/acre.

In combination with the seed, the following rates of tackifier will be utilized:

Table 3-7 Suggested Proportions of Tack to Fiber

slope angle (deg)	slope ratio (rise:run)	percent slope	lbs. Tack per ton fiber	ratio tack to fiber
14	1:4	25	60(min)*	1 : 30
26	1:2	50	80	1 : 25
33	1: 1 ½	66	100	1 : 20
45	1: 1	100	120	1 : 16
57	1 ½:1	150	140	1 : 14
64	2:1	200	160(min)	1 : 12

* 60 pounds is suggested as a minimum to insure excellent stabilization; however, in many conditions 40 pounds of Tack per acre has given excellent results on a 1:4 or less slope. (Rates of Tack were developed with respect to velocity and erosive power of water which is proportional to the square root of the slope.) An empirical factor was determined from laboratory and field studies to arrive at the min Tack fiber ratio. Thus, 60 pounds of Tack per ton of fiber is about min for slopes up to 20 pct and the empirical factor is determined as 60 divided 20 pct = For a 100 pct slope (1:1 or 45 degrees) the ratio of Tack to fiber is calculated as: (100 pct) (12) = 120 pounds. Tackifier to be used for Hydroseeding and Hydromulching to Serve as Mulch or Soil Binder.

Planting Methods

The reclaimed areas will be seeded with a hydro-seeder or by hand. Many shrubs and all trees will be planted by hand setting to ensure a permanent plant cover.

All hydroseeded or hand seeded areas, will be lightly raked to insure adequate soil/seed contact. On slopes greater than 2:1, a two step hydroseeding method will be used. One half of the seed amount will be applied and raked and then the remaining seed will be applied.

A min of 120 lbs/acre fiber will be used when hydroseeding.

Seedlings will be planted in Apr - May or Sept - Oct depending on availability and sequence of completion, plants will be grouped to provide wildlife cover. Spacing within the group is defined in Table 3-5 and Table 3-6 and will be correlated to the reference area.

The planting of seedlings will be done within two years of the seeding effort in order to evaluate the number and species of seedlings necessary to insure both composition and stocking of woody species to maximize utilization by wildlife and domestic grazing.

The species and numbers of individual plants are correlated to the reference area which was established during July of 1983.

Planting will be done utilizing a powered auger with a capability of drilling a 3 inch plus diameter hole to a depth of 16 inches or by hand with a shovel. The roots of the seedling will be

arranged in as near natural position as possible paying special attention not to "J" the root tips. (Figure 3-1).

By holding the seedling at the root crown, soil will be compacted back around the roots being careful to leave no air pockets or loose dirt (which would constitute settling). The tree will be firm when light pressure is exerted on the needles and standing in an erect position. Only hands shall be used to pack soil around the tree, the use of a stick or foot is strictly forbidden.

At all times the trees will be protected from direct sun light and special care will be exhibited when lifting the seedling from the planting bag to the prepared hole. The spacing of planted shrubs and trees will be to obtain the desired density and diversity while providing small clumps of cover for wildlife on approximately 100 ft intervals throughout the areas of disturbance that are in excess of 2 acre in size.

Field storage facilities are illustrated in Figure 3-2. In the event snow is not available, a similar cache can be constructed using wet burlap and damp straw.

The mine will have to maintain a sorting, packaging and storing tent at the cache site. A sorting table will need to be set up in one tent. Each seedling must be examined and all that do not have a 2 to 1 crown to root relationship or are damaged must be discarded. The seedlings then need to be dipped in a vermiculite slurry and then rolled in wet burlap and placed in canvas planting bags.

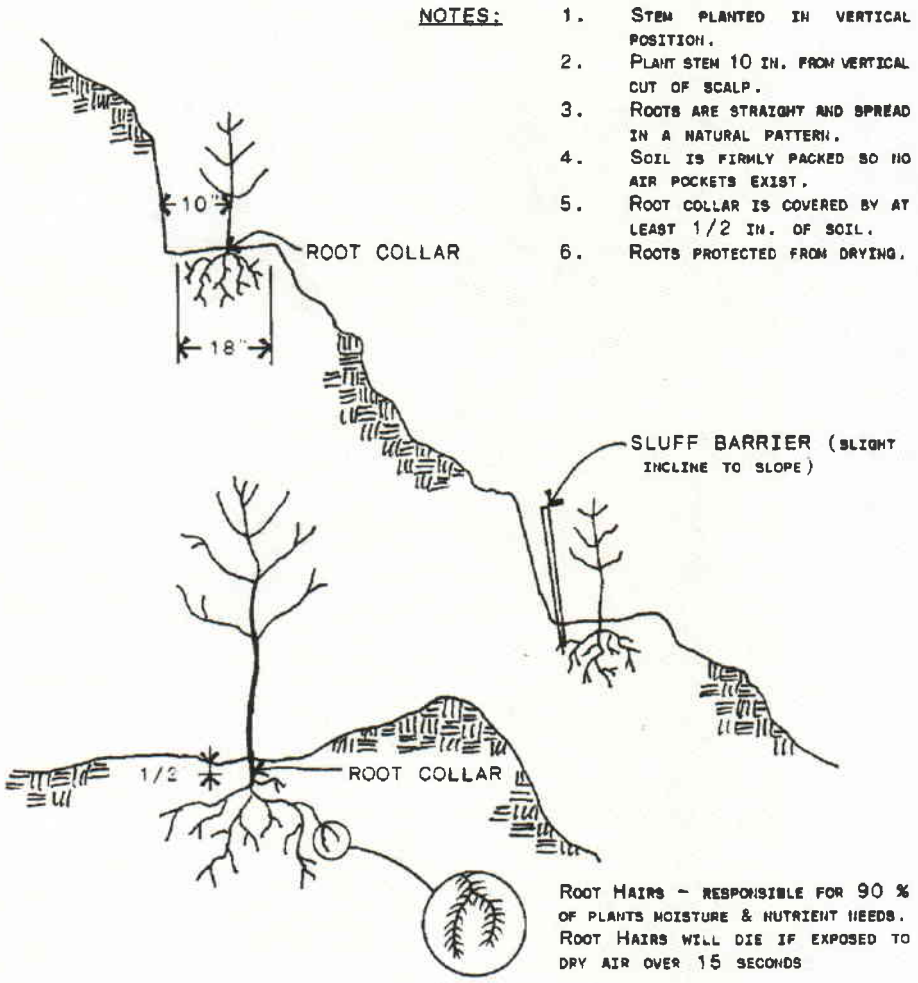
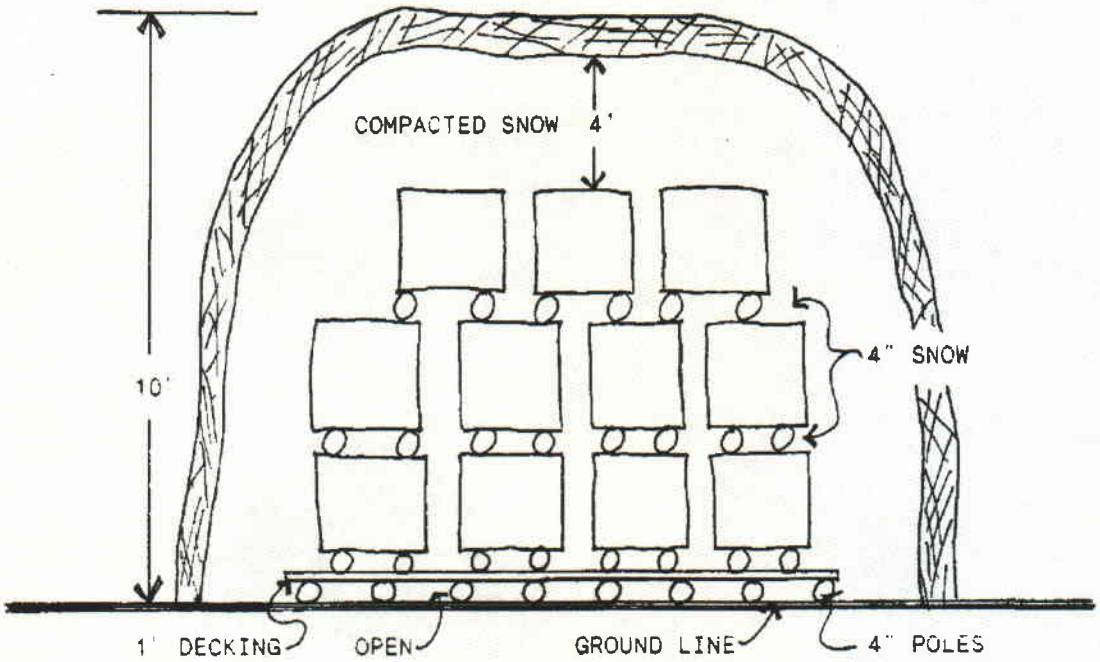


Figure 3-2 Correct Planting Procedures



SNOW CASHE WILL MAINTAIN SEEDLINGS AT 32°F AND RELATIVE HUMIDITY OF 100%. SEEDLINGS SHOULD BE PLACED IN A COOL SHADED AREA 24 HOURS PRIOR TO PLANTING.

Figure3-3 Seedling Storage

The trees can only be left in the bags for twenty-four hour periods and then must be repacked following the same procedures. The field handling of packed trees requires the crowns be kept moist and the bags covered with insulated tarps and stored in shaded areas.

During breaks, lunch, etc., the crews planting bags must be placed in shaded areas. At the end of each operational day all bags must be unpacked and the trees re-dipped in vermiculite and rolled in wet burlap and repackaged to be used first the succeeding day.

341.230 Mulching Techniques

Following the seeding effort all seeded areas with slopes flatter than 2:1 will be hydromulched. The rate of application of the wood fiber mulch is 120 lbs/acre.

The mulch will also be fortified with Tack as previously indicated according to slope. Fertilization and/or neutralizing compounds required according to R645-301-243. will be incorporated in the mulch slurry.

Slopes 2:1 or steeper will be mulched with erosion control matting. The matting will be applied as per manufacturers specifications.

The mulch will be certified as weed free by the county agriculture agent. Copies of this certification, along with weight tickets from a certified scale will be submitted to the Division. All straw or hay mulch will be incorporated into the top 6 in. of topsoil or crimped in order to anchor the mulch to the soil surface.

341.240 Irrigation

N/A

341.250 Determination of Revegetation Success

All reclaimed areas will be monitored to determine when bond release parameters are achieved. Success standards will be based on the reference areas. With the last Five-Year Permit Renewal a map will be submitted with the area partitioned into three to five areas with similar slope and aspect and each of these areas or a weighted average will be used to compare with the reference areas corresponding to that area for bond release.

Qualitative (ocular estimates) monitoring will be completed each year until bond release with the intent of identifying problem areas. Quantitative monitoring will be made during years 2, 3, 5, 9 and 10 until bond releases. Both the final reclaimed area and reference area will be sampled for cover, density (woody plants). Species composition data will be collected and compiled in year 2, 3, 5, 9, and 10 using cover sampling data. Productivity measurements will be collected during years 9 and 10 of the bond liability period.

The success of the reclamation effort will be evaluated by detailed sampling of cover, woody plant density and production of reference and reclaimed areas. The data from the reclaimed areas and the reference area will be collected during the same growing season. If there is no significant difference in cover woody plant density and production between the reclaimed areas and the reference areas when tested at the 90 pct significance level using a one-tailed t-test, then the areas will be judged to adequately reclaimed relative to cover and production.

Wood plant density standards will be sampled for each reference area as well as the reclaimed areas and the success of the reclaimed area based on the results from the reference areas (90 pct pre-mining stock level survival at bond release) cover, woody plant density on reclaimed and reference areas will be measured using the same methods employed during the baseline studies. At the time of bond release, trees and shrubs, used to achieve success, will be healthy and at least 80 pct will have been in place for at least eight growing seasons. No trees and shrubs in place for less than two growing seasons will be counted in determining stocking adequacy. The woody plant density success standard for the Wild Horse Ridge area will be equal to 1,010 trees and shrubs per acre. Although this is less than that of the reference area, it is the density measured in the area prior to disturbance and is considered adequate.

Standard methods will be applied to determine the degree of success for revegetation attempts. Production will be measured using a Harvest methodology. Shrub density data will be collected, using 1 m x 50 m transects.

One of the greatest challenges of revegetation is to create reclaimed areas which have a large number of desirable species. Species diversity on the reclaimed areas will be encouraged by including a variety of grasses, forbs, and shrubs in seeding and planting mixes.

Species diversity will be judged adequate when the relative cover and pct distribution of biomass for the major life form groups approx that which occurs in the reference areas. That is, if the relative cover by perennial grasses is 50 pct in the reference areas, then the relative cover by perennial grasses on the reclaimed areas should also be approx 50 pct. This same relationship should also hold true for productivity. If most of the cover and production were being provided by annual forbs on the reclaimed areas and by perennial grasses on the reference areas, then the reclamation would be judged unsuccessful.

The purpose of the above procedures is to demonstrate that based on cover, production, woody plant density, and species diversity, the disturbed areas have been returned to stable plant communities capable of withstanding the intended post-mining land use.

R645-301-342 Fish and Wildlife Reclamation Plan

The post-mining land use that reclamation will attempt to provide for is wildlife habitat. Revegetation in the mine area will seek to enhance forage values of the reclaimed area sites thus tailoring them to the needs of wildlife and minimizing the undesirable shrubs found in the adjacent area.

R645-301-350 Performance Standards

R645-301-351 General Requirements

All coal mining and reclamation operations will be carried out according to plans provided in R645-301-330 through R645-301-340.

R645-301-352 Contemporaneous Reclamation

Contemporaneous reclamation will be conducted as practicable on disturbed areas of the permit that will not be needed or affected by future operations. The procedures used will be the same as the ones outlined in R645-301-340.

R645-301-353 Revegetation General Requirements

A vegetative cover that is in accordance with the approved permit and reclamation plan or otherwise acceptable, will be established on regarded disturbed areas. The cover will be: diverse, effective and permanent; comprised of native species or desirable introduced species approved by the Division; equal in extent of cover to the natural vegetation of the area; and capable of stabilizing soil.

The reestablished plant species will be compatible with the approved post mining land use; have the same seasonal characteristics of growth as the original vegetation; be capable of plant succession and self-regeneration; be compatible with the plant and animal species of the area; and meet the requirements of applicable Utah and Federal species laws or regulations.

Species having the qualities to meet the above mentioned vegetative cover requirements, as well as rates of application of seeds and transplants are shown in Tables 3-5 and 3-6.

353.250 Noxious Weeds

The following weeds are officially designated as noxious for the State of Utah, as per the authority vested in the Commissioner of Agriculture under Section 4-17-3, Utah Noxious Weed Act, and will be controlled as directed by the Emery County, Extension Agent if found within the permit area:

Bermudagrass	Cynodon dactylon
Bindweed	Convolvulus spp.
Broadleaved Peppergrass (Tall Whitetop)	Lepidium latifolium
Canada Thistle	Cirsium arvense
Diffuse Knapweed	Centaurea diffusa
Dyers Woad	Isatis tinctoria
Johnson Grass	Sorghum halepense
Leafy Spurge	Euohorbia esula
Medusahead	Taeniatherum caput-medusae
Musk Thistle	Carduus nutans
Perennial Sorghum	Sorghum halepense & Sorghum Almum
Purple Loosestrife	Lythrum salicaria
Quackgrass	Agropyron repens
Russian Knapweed	Centaurea repens
Scotch Thistle (Cotton Thistle)	Onopordium acanthium
Whitetop	Cardaria spp.
Yellow starthistle	Centaurea solstitialis

R645-301-354 Revegetation: Timing

Disturbed areas will be planted during the first normal period for favorable planting after replacement of the plant-growth medium.

R645-301-355 Revegetation: Mulching and Other Soil Stabilizing

On all reclaimed areas a wood fiber, straw or hay mulch will be used to enhance moisture retention required for seed germination. Tackifier will be added to the wood fiber mulch to help it adhere to the soil. A min of 60 lbs tackifier/ton fiber will be applied, with steeper sloping areas requiring more as shown in R645-301-341 Table 3-4. Steeply sloped areas will require erosion control matting. These areas will be noted on the detailed revegetation plan and maps to be submitted in the last Five-Year Permit Renewal prior to reclamation. Soil stabilizing practices are outlined in Chapter 2, R645-301-244.

R645-301-356 Revegetation: Standards for Success

All revegetated areas will within at least 80% of the reference areas in density and population.

C.W. Mining Company will assure that for the Tank Seam area there will be at least 1,000 plants per acre after reclamation, and that at least half of the woody plants (by number) will be comprised of Mountain Mahogany, Skunkbrush, and Vasey Big Sagebrush.

R645-301-357 Revegetation: Extended Responsibility Period

The average annual precipitation at Bear Canyon is 12 inches, therefore, the period of responsibility will continue for a period of not less than ten full years.

R645-301-358 Protection of Fish, Wildlife and Related Environmental Values

C. W. Mining Company will to the extent possible be using the best technology currently available, minimize disturbances and adverse impacts on fish, wildlife, and related environmental values and will achieve enhancement of such resources where practicable.

Mitigation of mining impacts on and management of wildlife are usually considered and the plans for implementation prior to any perturbation. These actions often follow one of three general forms:

a. Design of facilities and access or transportation modes to minimize impacts

b. Operation of the mine and associated facilities to minimize impact

c. Enhancement of wildlife habitat both in the vicinity of and away form the mine in order to mitigate losses that may occur.

Since no impact to the perennial waters of the permit area is expected in the foreseeable future due to the stream buffer zones and runoff control measures, no special mitigation plan

concerning Bear Creek is presented here. The creek was monitored for water quality condition with monthly sampling in order to acquire a baseline description of the resource. This baseline provides a solid ground for future impact analysis and mitigation planning if the need arises.

In new mine operations it is easy to suggest, provide and implement mitigative and management measures, but in the case of the Bear Canyon Mine, which is already in operation pre-construction design and associated mitigation and management does not apply. The terrestrial wildlife inhabiting and utilizing the area of concern are accustomed to the present facilities and have adjusted their behavior, including migration patterns, so that change would be of more impact than would retaining the status quo.

Construction and operation of the scale-house, stockpile area and road could potentially disturb wildlife. To minimize habitat disturbance and loss, surface activity will be kept to a minimum.

The mine activities will take into consideration potential conflict with deer and elk reproductive activity and any small acreage involved will be restored as quickly as possible by redistribution of topsoil within the disturbed area, with immediate reseeding and replanting of native seeds and vegetation. Because of the small size of the area, natural reseeding will also occur from the surrounding area. The seral stage habitat created will be beneficial to deer, who readily utilize seral stages of mixed conifer-aspen forest.

Construction of the Mine Site and Haul Road are sources of disturbance. Habitat would be lost temporarily during construction and permanently where the mine is located. Since this is in a wintering area the same community reestablishing and augmenting techniques would be used. The terrain is such that established trails do not exist.

Little riparian habitats exist within the area, there will be little impact by the proposed action. All water is intermittent but since water is such a limiting resource to game animals, care will be taken to prevent disturbance, erosion, or coal deposition in the ephemeral channels. Roads will be routed or acceptable crossings built to avoid disturbance or erosion. Coal will be wetted to prevent blowing if necessary.

As determined in consultation with UDWR, all hazards associated with the expansion and mine operation will be covered, buffered or fenced to prevent damage to wildlife of concern.

Since there are crucial critical periods in the life history of high interest species such as mule deer and elk, the applicant will communicate such to their employees who will be admonished to avoid all unnecessary disturbance and harassment of wildlife species. In addition, all employees will be required to view the film "Coal Mining and Wildlife": as a tool to educate the mine personnel on their role in safeguarding Utah's wildlife.

In any situation not previously mentioned where wildlife habitats are disturbed by this proposed action, reclamation will be implemented by the best available methods and agreeable to

UDWR and the appropriate management agencies. The old road up Bear Creek is an example of mitigation which was completed by October, 1984.

Wildlife Mitigation

Co-Op, in order to mitigate the loss of approximately 10 acres of Mule deer winter range in association with the construction of the Bear Canyon Mine, has agreed to the following course of action with UDWR:

a. The reclamation of a major portion of the abandoned Bear Canyon county road approximately 2 acres (completed Fall 1984).

b. Contemporaneous reclamation of portions of Bear Canyon permit area-topsoil stockpiles, down slopes, power line corridor, etc. Approximately 3.2 acres (started Fall 1983, completion Fall 1985).

c. Enhancement of Bear Creek off permit. This work was accomplished in 1986 and constituted the enhancement of approximately 7 acres of stream channel. The work involved the installation of velocity dissipaters, planting of willows, and compatible wildlife browse species in the stream channel.

In addition, Co-Op has agreed that in the event that escarpment failure due to subsidence impacts any raptor nests within the permit area, that Co-Op will notify UDWR and the U.S. Fish and Wildlife Service and take whatever action is recommended in order to mitigate such loss. ~~At this time no raptor nest are at risk due to their absence from all areas of potential impact. Raptor nests will be safeguarded from subsidence by maintaining a min of a 100' barrier to the outcrop.~~

C. W. Mining will develop a raptor mitigation by July 1, 2007 for all areas where nest may potentially be impacted. Based on preliminary meetings the plan will be as follows. By July 1, 2007 site specific evaluations will be done by qualified personnel and several mitigation methods will be developed for each site based on various timing and mining scenarios. One year prior to undermining a specific nest an application for a take permit will be submitted outlining the various mitigation methods that have been previously determined. Three months prior to undermining the nest, at which time the exact timing and methods will be know, the specific mitigation that correlates to the timing and method will be selected and implemented. All regulating and concerned agency will be involved at each step.

UDWR authorities will be consulted, in the event a need for pesticides becomes necessary to control rodents or insects during reclamation. No control measures will be used without prior approval by all parties concerned.

In order to mitigate a possible impact to a red tail hawk nest during the WHR construction DWR required C.W. Mining Company to perform a Raptor prey base study in 2005. The results of this study are included in Appendix 3N. ~~will require some mitigation for the loss of Big Game Habitat and for the potential loss of raptor nesting during the construction and operation of the facilities. C. W. Mining Company is working with the Division of Wildlife Resources to develop a raptor prey base study and will complete the study in the summer of 2003 for mitigation.~~

In the event that a crack forms that interferes with any migratory paths, C.W. Mining will seal the cracks in a method acceptable to the land owner.

Stream Buffer Zone

Current surface facilities are in the upper reaches of the Bear Creek drainage, which is a tributary of Huntington Creek drainage. Appropriate sedimentation ponds have been constructed. This coupled with coal pile drainage ditches, clear water diversion, water bars, and wind erosion control measures within the permit area disturbed areas, will assure protection from mining impact of aquatic resources far downstream from the mine. Thus, no aquatic biological community determinations have been made relative to surface activities. Stream buffer zones are established along Bear Creek as determined by DOGM to insure protection of the stream channel. Stream buffer zone signs are in place at approximately 200 foot intervals along Bear Creek.

FISH AND WILDLIFE MONITORING

Bear Creek does not warrant a biological or habitat monitoring effort since it is naturally of poor quality. Water quality will be monitored as outlined in R645-301-731.200. Data collected will be correlated with water quality and hydrology measurements discussed in R645-301-731.200. If subsidence should become evident in the drainage area that contributes to Bear Creek or Fish Creek, monitoring of aquatic macroinvertebrates and habitat changes will be instated using approved methodology to collect data as the base for impact evaluation. Plate 7-4 shows all water monitoring sites used to determine impacts to flows and watersheds.

Co-Op has monitored all existing power transmission lines in order to determine use by raptors. No use was observed, Co-Op will take all necessary measures to ensure the poles and/or

structures are safe. All new poles and power transmission facilities will be constructed to be raptor protected, and will conform with designs shown in both the Avian Power Line Interaction Committee's (APLIC) publications, "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994," and, "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996". ~~In April 1988 DOGM consented to allow suspension of raptor surveys unless new disturbances warrant a clearance survey (Appendix 3-L)~~.

C.W. Mining will perform raptor surveys every year during the mine life.

Vegetation Sampling

Of

Tank Seam Access Road

Reference Area

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Vegetation Sampling of the Tank Seam Access Road Reference Area

Scope

The Co-Op Mining Company in collaboration with the State of Utah, Division of Oil, Gas & Mining (DOGM) selected a reference areas a standard for future revegetation. The purpose of this document is to provide data for the reference area to be compared with data form an area proposed for disturbance that was sampled in 1992 (called "The Proposed Disturbed Tank Seam Access Road"). This road has been proposed for disturbance to access projected new mining activities by the Co-Op Mining Company.

Introduction

General Site Description

The Tank Seam Access Road Reference Area is located in a native plant community in the same general area as part of the "Proposed Disturbed Tank Seam Access Road." The proposed disturbance and reference area lie within Bear Canyon, a branch of Huntington Canyon located near the city of Huntington, Utah. Slopes that surround the canyon are primarily dominated by pinion-juniper and mountain brush communities. The sample area was on a east-facing exposure on a 38° slope. In their native, undisturbed state, the canyon bottoms are comprised chiefly of sagebrush/grass and riparian communities.

Bear Canyon maintains active mine facilities. Several areas have been disturbed as a result of the mine activities and some of these areas have been reclaimed and reseeded.

Methods

Sampling methodologies of the reference area closely approximated those from sampling the proposed disturbed areas in 1992. These methods are reported below.

Quantitative and qualitative data were taken on the sample sites. Sampling was accomplished in July 1993.

Transect Placement

Transect lines were randomly placed in the reference area. At regular points on the transect lines a random number was generated which placed each sample location at right angles to the transect lines.

Cover and Composition

As was implemented in sampling the proposed disturbance area, the cover estimates for the reference area were made using ocular methods with meter square quadrants. Species composition and relative frequencies were also assessed form the quadrants. Additional information recorded on data sheets were: established precipitation, erosion, slope, exposure, grazing use, animal disturbance and other appropriate notes.

Woody Species Density

Density of woody plant species were recorded using the point quarter distance method and by sing belt transects. In the pint quarter method, the aforementioned regular pints were placed on the sample sites and delineated into four quarters. The distance to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy

Sampling adequacy for woody species density and cover was achieved using formulas form "Statistical Methods" (Snedocor and Cochran 1980), with the goal that at least 80% of the samples were within 10% of the true mean for the plant communities of the area. The formula used is given below.

$$\text{nmin} = \left[\frac{1.28\,(s)}{x\ (.1)} \right]^2$$

where,

nmin = minimum adequate sample
s = standard deviation
x = sample mean
.1 = confidence interval

Photographs

Color photographs of the sample area were taken at the time of sampling and were submitted with this report.

Raw Data

The raw data were also submitted with this report (and the previous report for the proposed disturbance area) which would facilitate future scrutiny of the data and future scrutiny of the data and further statistical testing if desired.

Results

Total living cover of the site was estimated at 31.25% (Table 2). Grasses dominated the cover and compromised 67.26% of the living cover (Table 2). As in the proposed disturbed area, the dominate grass species was Salina wildrye (Elymus salinus) and was estimated at 19.40% cover. Winterfat (ceratoides lanata), however, was the most common woody species followed by pinion pine (Pinus edulis) and rabbitbrush (Chrysothamnus nauseosus). For a list of cover by species, refer to Table 3.

Woody species density was estimated at 628.72 individuals per acre (Table 4) by the point quarter method. The most abundant species was corymb buckwheat (Eriogonum cormbosum) followed by pinion pine. For a statistical comparison of the proposed disturbed area and its reference area, refer to the sampling report for the "Proposed Disturbed Tank Seam Access Road" (March 1993).

Table 1:

Co-Op Mine Area
Qualitative Sampling Data Sheet and
Quantitative/Qualitative Notes
1993

Site Name: Tank Seam Access Road Reference Area

Area: Bear Canyon

Date: 21 July 1993

Workers: P. Collins, D. Collins

Slope: 38 deg.

Exposure: E

Animal Use/Disturbance: Moderate deer use

Erosion: Negligible

Cover: (see quantitative data)

Dominant Plant Species Observed: (see quantitative data)

Notes:

1) (see report)

Table 2: Total cover and composition summary for the Tank Seam Access Road Reference Area at the Co-Op Mine.

Total Cover	% Mean Cover	Standard Deviation	Sample Size
Living Cover	31.25	9.20	20
Litter	14.60	12.73	20
Bareground	21.40	12.09	20
Rock	32.75	19.52	20
Composition			
Shrubs	28.49	32.20	20
Forbs	4.25	13.90	20
Grasses	67.26	33.36	20

Table 3: Species cover and frequency summary for the Tank Seam Access Road Reference Area at the Co-Op Mine.

Species	% Mean Cover	Standard Deviation	Sample Size	Relative Frequency
Trees & Shrubs				
Chrysothamnus nauseosus	1.50	4.77	20	10.00
Ceratoides lanata	5.10	11.52	20	20.00
Eriognum corymbosum	1.25	3.11	20	15.00
Pinus edulis	2.75	8.29	20	10.00
Forbs				
Erigeron sp.	0.50	2.18	20	5.00
Stanleya pinnata	0.75	3.27	20	5.00
Grasses				
Elymus cinereus	19.40	10.17	20	95.00

Table 4: Woody species densities of the Tank Seam Access Road Reference Area at the Co-Op Mine.

		Number/Acre
Ceratoides lanata		130.77
Chrysothamnus nauseosus		45.90
Eriogonum corymbosum		248.97
Juniperus osteosperma		32.69
Pinus edulis		175.18
Yucca harrimaniae		13.20
	Total	628.72

Statistical Analyses:

Proposed Disturbed Tank Seam Access Road
vs.
Tank Seam Access Road Reference Area

The Co-Op Mining Company in collaboration with the State of Utah, Division of Oil, Gas & Mining (GOGM) selected a reference area as a standard for future revegetation success. Group comparison statistical analyses were performed to compare the "Proposed Disturbed Tank Seam Access Road" with its reference area.

Student's t tests indicated the reference area to be significantly greater than the proposed disturbance area for both cover and woody species density (see following summary sheet). The differences could probably be explained in a few ways. Because of its length, the access road had a greater diversity of exposures, slopes, elevations, and other general environmental conditions. Whereas, the reference area was in one general area – with one exposure and all the samples recorded at approximately the same physiognomy. Furthermore, the overstory of the proposed disturbed area was not recorded. If it were recoded and added to the understory, the differences between the two sample areas could have likely been non-significant.

The woody species differences were due to the greater amount of shrubs in the reference area. When one compares the trees (pinion pine and Utah juniper) the densities were similar. Again, the differences probably were a result of the diversity of environmental conditions on the proposed disturbed area when compared to the reference area.

For the above reasons, even with the differences, the reference area selected is probably an appropriate standard for final revegetation success. (The raw data, summation tables and report for the Tank Seam Access Reference Area were reported in Appendix 9-A).

Statistical summary sheet for the Proposed Disturbed Tank Seam Access Road and Tank Seam Access Road Reference Area of the Co-Op Mine.

Proposed Disturbed Tank Seam Access Road

Total Living Cover**	x= 19.50	s= 6.87	n= 40
Density	x= 124.27*	s= 22.48	n= 40
Aspect	variable		
Slope	variable		

Tank Seam Access Road Reference Area

Total Living Cover	x= 31.25	s= 9.20	n= 20
Density	x= 96.79*	s= 19.68	n= 24
Aspect	East		
Slope	38 deg.		

Statistical Analyses

Cover:
Student's t-value = -5.564
Degree of freedom = 58
Significance level = <.005

Density:
Student's t-value = 4.774
Degrees of Freedom = 62
Significance level = <.005

---

x = sample mean, s = sample standard deviation,
n = sample size, N.S. = nonsignificant,
* average distance in inches at each sample location
** represents understory cover only.

Appendix 3-B

MISC. DATA

United States
Department of
Agriculture

Soil
Conservation
Service

350 North 4th East
Price, Utah 84501

September 26, 1983

Mel Coonrod
Co-op Mine
P. O. Box 358
Elmo, Utah 84521

Dear Mel,

Trail Canyon Reference Area:
Pinyon-Juniper Grass Site
The production is 650 lbs herbage production for this year. The range site conditon is good.

Trail Canyon Riparian Reference Area:
The production is 2,650-3,000 lbs/acre. The condition is fair.

Bear Canyon Comparative Area:
Pinyon-Juniper Grass Site
The production is 600 lbs/acre. The range site condition is fair.

Geoarge S. Cook
Range Conservationist

MEC Mangum Engineering Consultants

388 East Boynton Road • Kaysville, Utah 84037 • (801) 544-3641

George A. Morris
Forest Supervisor
United States Department of Agriculture
Forest Service, Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501Larry B. Dalton

19 December 1990

George A. Morris:

Ref: Federal Lease, Bear Canyon Mine, Co-Op Mining Co., Bear Creek Canyon, Huntington Canyon Area, Emery County, Utah

The Utah Department of Oil Gas and Mining has requested that Co-Op Mining Company verify through the appropriate agencies the status of any threatened or endangered plants expected within the federal lease area. The mine is located as listed below:

Fee Land, T16S, R7E SLBM, Sec. 14; S1/2, Sec. 23: E1/2, E1/2 NW1/4, E1/2 SW1/4, Sec. 24: All land West of North-South Trending Bear Canyon Fault, Section 25: All land West of North-South Trending Bear Canyon Fault, Sec. 26: NE1/4 NE1/4, NW1/4 NE1/4, N1/2 SW1/4 NE1/4 and the access/haul road and topsoil storage area as shown on plate 2-1 of the Mining and Reclamation Plan.

Federal Lease U024316, T16S, R7E SLBM, Sec. 13 W 1/2 W 1/2, Sec. 14 E 1/2 NW 1/4, NE 1/4

Federal Lease U024318, T16S, R7E SLBM, Sec. 26 E 1/2 NW 1/4

If you can provide this information please forward a statement suitable for submittal to DOGM as soon as possible to the address listed on this letter, so I can meet DOGM requirements. If you have any questions please call. I can be reached at 521-3739 during the day.

Thank you,

Kimly C. Mangum, P.E.

United States
Department of
Agriculture

Forest
Service

Manti-La Sal
National Forest

599 West Price River Dr.
Price, Utah 84501

Reply to: 2820

Date: January 29, 1991

Kim Mangum
Mangum Engineering Consultants
388 East Boynton Road
Kaysville, Utah 84037

Re: Federal Lease, Bear Canyon Mine, Co-op Mining Co., Bear Creek Canyon Huntington Canyon area, Emery County, Utah.

Dear Mr. Mangum:

Our plant specialist, Bob Thompson, found in Bear Creek just below the Bear Canyon mine properties the sensitive plant species, Hedysarum occidental var canone, canyon sweet vetch. There is a good sized population, 50 to 100 plants in this area.

This plant has not been looked for on the mine properties as such but habitat exists in the canyon on and adjacent to the mine area in Bear Canyon.

It should be looked for in the Federal lease area.

Sincerely,

Kim L Hone

For
GEORGE MORRIS
Forest Supervisor

United States
Department of
Agriculture

Forest
Service

Manti-La Sal N.F.

Date: November 4, 1993

Co-op Mine
P.O. Box 1245
Huntington, Utah, 84528

Dear Sirs:

The area proposed for the new road extension on the south facing slope above the existing mine areas was inspected for threatened, endangered and sensitive plant species on Nov. 4, 1993 by Robert M. Thompson, USFS Botanist.

No habitat or population of any listed TE & S plant species were found within the proposed road extension area. This area is clear of any TE & S plant species.

Canyon Sweet Vetch, Hedysarum occidentals var. canone does occur on the mine property along Bear Creek bottom areas. This plant or its existing habitat will not be impacted by this proposed activity.

Robert M Thompson

Robert M. Thompson
Botanist

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

350 NORTH 400 EAST
PRICE, UTAH 84501

August 19, 1994

Charles Reynolds
CO-OP Mining Company
P.O. Box 1245
Huntington, Utah 84528

Dear Mr. Reynolds:

The information on the reference areas is as follows:

Shower House Reference Area -
Grass Pinyon Shrub Site
The production is 900 lbs. herbage air dry per acre. The condition is good and the potential production will also be about 900 lbs. per acre.

The Tank Seam Reference Area -
Pinyon Juniper grass curlleaf mountain mahogony site. The production is 700 lbs. herbage air dry per acre. The condition is good to excellent and the potential production will also be 700 lbs. per acre.

George S. Cook

George S. Cook
Range Conservationist

Appendix 3-C

Shower House Pad Vegetation

And Reference Area

Introduction

The following pages are a copy of a report prepared by Patrick Collins, Ph.D., Biologist/Reclamation Specialist, of Mt. Nebo Scientific. The report presents an evaluation of the existing vegetation in the area of the shower house pad and information on the reference area for the shower house pad. The vegetation survey was performed in October, 1992 for the shower house pad and September, 1993 for the reference area.

VEGETATION OF THE PROPOSED SHOWERHOUSE AREA FOR THE CO-OP MINE

Prepared
by

MT. NEBO SCIENTIFIC
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

for

CO-OP MINING COMPANY
P.O. Box 1245
Huntington, Utah 84528

by

Patrick Collins, Ph.D.

Dates

Field Work:	Proposed Disturbed Area - October 1992 Reference Area - September 1993
Reports:	Proposed Disturbed Showerhouse Area- December 1992 Proposed Disturbed & Reference Area - June 1994

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VEGETATION OF THE PROPOSED DISTURBED SHOWERHOUSE AND REFERENCE AREAS FOR THE CO-OP MINE

INTRODUCTION

Following are results from vegetation sampling of a reference area and an area that was proposed for disturbance by the CO-OP Mining Company. An earlier report was submitted (December 1992) showing baseline data of the proposed disturbed area with a commitment by the operator to select a reference area the following year. A reference area was later chosen by the operator and approved by the Division of Oil, Gas & Mining (DOGM) to be used as a standard of revegetation success. The reference area was sampled in 1993. The summarized data are reported in this document.

To facilitate comparisons of the proposed disturbed and reference areas, both sets of data and summaries were included in this report.

General Site Description

The proposed disturbed area is the site of the showerhouse

to be constructed by the CO-OP Mining Company in Bear Canyon. Total area of the site was estimated to be 1.84 acres with a southeast exposure and slopes ranging between 1 and 5 degrees.

An area of about 1 acre was designated as the reference area for the proposed disturbed showerhouse area. The reference area had approximately the same slope, exposure and vegetation as the proposed disturbed area.

The vegetative community of each area could be described as a transition zone between the pinyon-juniper hillsides and the sagebrush/grass alluvial bottomlands. Soils are generally deep and well-drained. The area is also used extensively by deer and other wildlife.

METHODS

Quantitative and qualitative data were taken from the proposed disturbed and reference areas. Sampling was accomplished on October 10, 1992 for the proposed disturbed area and September 3, 1993 for the reference area.

Cover and Composition

Vegetation sampling was conducted in an attempt to adequately describe the sample areas. Two - 200 ft. transects were randomly placed within each area. Along these transects, points were placed at 10 ft intervals. At each 10 ft mark, random numbers between 1 and 15 (ft.) were then chosen to place the quadrats perpendicularly on each side of the transect line.

Understory cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional information recorded on data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows A Utah Flora (Welch et al. 1987).

Woody Species Density

Density of woody plant species were recorded using the point quarter distance method (from Cottom and Curtis 1956) in the same areas described in the cover section above. In the point quarter method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average

Cover and Composition

Vegetation sampling was conducted in an attempt to adequately describe the sample areas. Two - 200 ft. transects were randomly placed within each area. Along these transects, points were placed at 10 ft intervals. At each 10 ft mark, random numbers between 1 and 15 (ft.) were then chosen to place the quadrats perpendicularly on each side of the transect line.

Understory cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional information recorded on data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows A Utah Flora (Welch et al. 1987).

Woody Species Density

Density of woody plant species were recorded using the point quarter distance method (from Cottom and Curtis 1956) in the same areas described in the cover section above. In the point quarter method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average

point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy

Sampling adequacy for cover and density was achieved by employing formulas from Snedocor and Cochran (1980), insuring that 80% of the samples were within 10% of the true mean. The formulas are shown on the summary tables.

Photographs

Color photographs were taken of the proposed disturbed and reference area plant communities and included in this report.

Raw Data

Raw data from which the summary tables are based are included at the end of this report.

RESULTS

Proposed Disturbed Showerhouse Area

Total living cover of the proposed disturbed showerhouse area was estimated at 46.13%. Woody species and grasses dominated the area constituting 42.64% and 56.48%, respectively (Table 1). The most common shrub by cover and frequency was big sagebrush (*Artemisia tridentata*). Most common grass by cover was needle-and-threadgrass (*Stipa comata*), whereas, the most frequently observed grass was Indian ricegrass (*Stipa hymenoides*) (Table 2). Forb species were seldom observed in the sample quadrats.

Woody species density was also calculated in the area. Big sagebrush was clearly the most important species by density, comprising nearly 85% of the total 1,960 individuals per acre on the site (Table 3).

Reference Area

Total living cover of the reference area was estimated at 53.88%. Woody species and grasses dominated the area constituting 29.75% and 68.07%, respectively (Table 4). Again, the most common shrub by cover and frequency was big sagebrush.

As in the proposed disturbed area, the most common grasses by cover and frequencies were needle-and-threadgrass and Indian ricegrass (Table 5). Forb species were seldom observed in the sample quadrats.

Woody species density was calculated in the area. Broom snakeweed (*Gutierrezia sarothrae*) and big sagebrush were the most important species by density, comprising 1,535 and 1,217 individuals per acre, respectively, (Table 6).

TABLE 1: Total cover and composition summary for the proposed disturbed showerhouse area of the CO-OP Mine.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZES
Living Cover*	46.13	9.97	40
Litter	18.60	12.92	40
Bareground	23.20	15.28	40
Rock	12.08	13.14	40
COMPOSITION			
Shrubs	42.64	26.63	40
Forbs	0.88	4.17	40
Grasses	56.48	26.20	40

* Sample was measured using the formula below:

$$nMin = \left[\frac{1.28\ (s)}{x\ (.1)} \right]^2$$

where,

x = sample mean,

s = standard deviation,

nMin = minimum samples required to insure 80% accuracy within 10% of the true mean.

TABLE 2: Species cover and frequency summary for the proposed disturbed showerhouse area of the CO-OP Mine.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
SHRUBS				
Artemisia tridentata	11.25	9.92	40	70.00
Brickelia microphylla	0.13	0.78	40	2.50
Chrysothamnus nauseosus	0.38	1.73	40	5.00
Juniperus osteosperma	5.25	13.27	40	20.00
Opuntia polyacantha	0.50	1.87	40	7.50
Pinus edulis	2.00	7.97	40	10.00
FORBS				
Lepidium montanum	0.13	0.78	40	2.50
Sphaeralcea grossulariaefolia	.25	1.56	40	2.50
GRASSES				
Bouteloua gracilis	1.00	6.24	40	2.50
Elymus spicatus	0.63	3.90	40	2.50
Elymus salinus	1.63	5.74	40	15.00
Stipa comata	14.75	15.29	40	65.00
Stipa hymenoides	8.25	9.12	40	70.00

TABLE 3: Woody species densities for the proposed disturbed showerhouse area of the CO-OP Mine.

	NUMBER/ACRE
Artemisia tridentata	1,649.99
Brickelia microphylla	16.34
Echinocereus triglochidiatus	16.34
Gutierrezia sarothae	16.34
Juniperus osteosperma	130.69
Opuntia polyacantha	65.35
Pinus edulis	65.35
TOTAL	1,960.40*

* Sample was measured using the formula below:

$$nMin = \left[\frac{1.28\ (s)}{x\ (.1)} \right]^2$$

where,

x = sample mean,

s = standard deviation,

nMin = minimum samples required to insure 80% accuracy within 10% of the true mean.

TABLE 4: Total cover and composition summary for the showerhouse reference area of the CO-OP Mine.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZES
Living Cover*	53.88	9.84	40
Litter	13.93	6.92	40
Bareground	26.48	12.55	40
Rock	5.73	3.77	40
COMPOSITION			
Shrubs	29.75	22.27	40
Forbs	2.18	6.57	40
Grasses	68.07	22.25	40

* Sample was measured using the formula below:

$$nMin = \left[\frac{1.28\ (s)}{x\ (.1)} \right]^2$$

where,

x = sample mean,

s = standard deviation,

nMin = minimum samples required to insure 80% accuracy within 10% of the true mean.

TABLE 5: Species cover and frequency summary for the showerhouse reference area of the CO-OP Mine.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
SHRUBS				
Artemisia tridentata	7.38	10.90	40	50.00
Ceratoides lanata	4.38	7.76	40	30.00
Chrysothamnus nauseosus	0.75	4.68	40	2.50
Gutierrezia sarothrae	4.13	6.79	40	35.00
Opuntia polyacantha	0.25	1.56	40	2.50
FORBS				
Circium sp.	0.13	0.78	40	2.50
Lepidium montanum	0.38	1.73	40	5.00
Machaeranthera canescens	0.38	1.32	40	7.50
Tragopogon dubius	0.13	0.78	40	2.50
GRASSES				
Bouteloua gracilis	1.25	4.97	40	7.50
Elymus salinus	9.50	12.79	40	52.50
Stipa comata	12.25	10.95	40	72.50
Stipa hymenoides	13.00	9.60	40	77.50

TABLE 6: Woody species densities for the showerhouse reference area of the CO-OP Mine.

	NUMBER/ACRE
Artemisia tridentata	1217.08
Ceratoides lanata	820.20
Chrysothamnus nauseosus	58.92
Gutierrezia sarothae	1534.58
Juniperus osteosperma	79.37
Opuntia polyacantha	58.92
Pinus edulis	58.92
TOTAL	3,827.99*

* Sample was measured using the formula below:

$$nMin = \left[\frac{1.28\ (s)}{x\ (.1)} \right]^2$$

where,

x = sample mean,

s = standard deviation,

nMin = minimum samples required to insure 80% accuracy within 10% of the true mean.

COLOR PHOTOGRAPHS

PROPOSED DISTURBED SHOWERHOUSE AREA

SHOWERHOUSE REFERENCE AREA

RAW DATA SHEETS

CO-OP MINE
Prop. Dist. Showerhouse
Exposure: S
Slope: 2 - 4 deg

Sample Date: 10 Oct 1992	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Pinus edulis	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	15.00	10.00	15.00	10.00	30.00	15.00	25.00	5.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00
Brickellia microphylla	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opuntia polyacantha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
Sphaeralcea grossulariaef	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lepidium montanum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES										
Stipa comata	30.00	30.00	25.00	10.00	25.00	35.00	15.00	30.00	40.00	0.00
Stipa hymenoides	0.00	10.00	5.00	10.00	5.00	5.00	5.00	0.00	0.00	10.00
Elymus salinus	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Bouteloua gracilis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER										
Total Living Cover	30.00	40.00	45.00	35.00	50.00	50.00	50.00	45.00	65.00	40.00
Litter	10.00	20.00	10.00	25.00	10.00	10.00	20.00	20.00	20.00	10.00
Bareground	50.00	35.00	40.00	35.00	35.00	15.00	10.00	15.00	5.00	25.00
Rock	10.00	5.00	5.00	5.00	5.00	25.00	20.00	20.00	10.00	25.00
% COMPOSITION										
Shrubs	0.00	0.00	33.33	42.86	30.00	20.00	60.00	33.33	38.46	75.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	100.00	100.00	66.67	57.14	70.00	80.00	40.00	66.67	61.54	25.00

11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00
0.00	0.00	0.00	0.00	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	5.00	20.00	25.00	10.00	0.00	15.00	25.00	15.00	5.00	25.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	60.00	0.00	20.00	20.00	0.00	5.00	25.00	0.00	5.00	20.00	40.00
0.00	5.00	10.00	0.00	0.00	5.00	15.00	0.00	10.00	10.00	5.00	10.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	70.00	40.00	45.00	30.00	50.00	35.00	50.00	30.00	50.00	50.00	60.00
25.00	10.00	25.00	25.00	15.00	40.00	10.00	45.00	5.00	45.00	5.00	20.00
5.00	15.00	25.00	25.00	35.00	5.00	50.00	4.00	5.00	4.00	40.00	19.00
25.00	5.00	10.00	5.00	20.00	5.00	5.00	1.00	60.00	1.00	5.00	1.00
44.44	7.14	50.00	55.56	33.33	90.00	42.86	50.00	66.67	70.00	50.00	16.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55.56	92.86	50.00	44.44	66.67	10.00	57.14	50.00	33.33	30.00	50.00	83.33

23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.00	20.00	20.00	15.00	35.00	20.00	0.00	5.00	10.00	5.00	0.00
0.00	35.00	0.00	0.00	0.00	5.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
30.00	5.00	35.00	20.00	0.00	5.00	0.00	5.00	0.00	25.00	0.00	0.00
10.00	5.00	0.00	10.00	25.00	0.00	5.00	25.00	30.00	20.00	10.00	40.00
5.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
65.00	50.00	55.00	50.00	40.00	50.00	35.00	40.00	50.00	55.00	50.00	40.00
29.00	10.00	20.00	45.00	10.00	40.00	5.00	10.00	10.00	35.00	5.00	5.00
5.00	30.00	24.00	3.00	45.00	5.00	5.00	45.00	39.00	5.00	25.00	35.00
1.00	10.00	1.00	2.00	5.00	5.00	55.00	5.00	1.00	5.00	20.00	20.00
30.77	70.00	36.36	40.00	37.50	80.00	71.43	0.00	40.00	18.18	10.00	0.00
0.00	10.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
69.23	20.00	63.64	60.00	62.50	20.00	28.57	75.00	60.00	81.82	90.00	100.00

CO-OP MINE
Prop. Dist. Showerhouse
Exposure: S
Slope: 2 - 4 deg
Sample Date: 10 Oct 1992

35.00	36.00	37.00	38.00	39.00	40.00	Mean	SDev	Freq	
									TREES & SHRUBS
0.00	0.00	0.00	0.00	25.00	5.00	2.00	7.97	16.00	Pinus edulis
0.00	0.00	0.00	0.00	0.00	0.00	11.25	9.92	70.00	Artemisia tridentata
30.00	65.00	5.00	0.00	0.00	0.00	5.25	13.27	20.00	Juniperus osteosperma
0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.78	2.50	Brickellia microphylla
0.00	0.00	10.00	5.00	0.00	0.00	0.50	1.87	7.50	Opuntia polyacantha
0.00	0.00	0.00	0.00	5.00	10.00	0.38	1.73	5.00	Chrysothamnus nauseosus
									FORBS
0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.78	2.50	Sphaeralcea grossulariaefol
0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.56	2.50	Lepidium montanum
									GRASSES
0.00	0.00	0.00	5.00	0.00	0.00	14.75	15.29	65.00	Stipa comata
5.00	0.00	20.00	0.00	5.00	0.00	8.25	9.12	70.00	Stipa hymenoides
0.00	0.00	0.00	0.00	0.00	0.00	1.63	5.74	15.00	Elymus salinus
0.00	0.00	0.00	40.00	0.00	0.00	1.00	6.24	2.50	Bouteloua gracilis
0.00	0.00	0.00	0.00	0.00	25.00	0.63	3.90	2.50	Elymus spicatus
									COVER
35.00	65.00	35.00	50.00	35.00	40.00	46.13	9.97		Total Living Cover
45.00	25.00	10.00	5.00	5.00	5.00	18.60	12.92		Litter
15.00	5.00	30.00	35.00	35.00	45.00	23.20	15.28		Bareground
5.00	5.00	25.00	10.00	25.00	10.00	12.08	13.14		Rock
									% COMPOSITION
85.71	100.00	42.86	10.00	85.71	37.50	42.64	26.63		Shrubs
0.00	0.00	0.00	0.00	0.00	0.00	0.88	4.17		Forbs
14.29	0.00	57.14	90.00	14.29	62.50	56.48	26.20		Grasses

CO-OP MINE
Trail Canyon
Shower House Ref Area
PJ/Sagebrush/Grass
Exposure: SE
Slope: 1 - 3 deg

Sample Date: 3 Sept 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Artemisia tridentata	25.00	10.00	10.00	10.00	30.00	25.00	25.00	0.00	40.00	0.00	10.00
Ceratoides lanata	0.00	25.00	15.00	10.00	10.00	0.00	5.00	0.00	0.00	0.00	10.00
Gutierrezia sarothae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00
Opuntia polyacanta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Lepidium montanum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tragopogon dubius	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Circium sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Stipa comata	15.00	20.00	20.00	10.00	25.00	15.00	10.00	10.00	10.00	0.00	25.00
Bouteloua gracilis	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	0.00	20.00	10.00	0.00	10.00	0.00	10.00	15.00	25.00	10.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	20.00	35.00	0.00	40.00	0.00
COVER											
Total Living Cover	45.00	55.00	65.00	40.00	65.00	50.00	60.00	60.00	65.00	70.00	55.00
Litter	10.00	10.00	20.00	10.00	10.00	20.00	25.00	10.00	20.00	10.00	24.00
Bareground	40.00	30.00	10.00	40.00	20.00	25.00	10.00	25.00	10.00	15.00	20.00
Rock	5.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00	5.00	1.00
% COMPOSITION											
Shrubs	55.56	63.64	38.46	50.00	61.54	50.00	50.00	8.33	61.54	7.14	36.36
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	44.44	36.36	61.54	50.00	38.46	50.00	50.00	91.67	38.46	92.86	63.64

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00
5.00	0.00	10.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	5.00	0.00	0.00	0.00
0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	25.00	5.00	0.00	10.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	20.00	10.00	0.00	25.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	10.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	20.00	0.00	25.00	30.00	20.00	15.00	20.00	15.00	25.00	20.00	35.00	25.00	20.00
25.00	15.00	40.00	5.00	30.00	0.00	0.00	10.00	0.00	10.00	5.00	5.00	15.00	0.00
40.00	40.00	70.00	50.00	60.00	50.00	40.00	40.00	65.00	45.00	40.00	50.00	50.00	55.00
9.00	5.00	20.00	10.00	20.00	10.00	10.00	25.00	10.00	10.00	15.00	10.00	15.00	5.00
50.00	45.00	5.00	35.00	15.00	35.00	40.00	30.00	20.00	35.00	40.00	35.00	30.00	35.00
1.00	10.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00
12.50	12.50	42.86	20.00	0.00	40.00	25.00	12.50	76.92	22.22	12.50	20.00	0.00	18.18
0.00	0.00	0.00	10.00	0.00	0.00	37.50	12.50	0.00	0.00	0.00	0.00	0.00	0.00
87.50	87.50	57.14	70.00	100.00	60.00	37.50	75.00	23.08	77.78	87.50	80.00	100.00	81.82

26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00	38.00
0.00	25.00	5.00	5.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	35.00	0.00
25.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	15.00	15.00	20.00	0.00	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	25.00	25.00	15.00	5.00	25.00	10.00	20.00	35.00	25.00	0.00	5.00	45.00
0.00	20.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	10.00	5.00	15.00	15.00	10.00	0.00	10.00	25.00	0.00	10.00
0.00	0.00	0.00	10.00	40.00	5.00	10.00	10.00	0.00	5.00	15.00	0.00	0.00
50.00	70.00	55.00	45.00	65.00	60.00	50.00	55.00	65.00	40.00	55.00	70.00	60.00
5.00	10.00	10.00	30.00	5.00	25.00	10.00	25.00	25.00	10.00	15.00	20.00	10.00
20.00	15.00	30.00	20.00	25.00	10.00	30.00	15.00	5.00	45.00	25.00	5.00	29.00
25.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00	1.00
50.00	35.71	9.09	11.11	23.08	25.00	30.00	27.27	38.46	0.00	27.27	92.86	0.00
0.00	0.00	0.00	11.11	0.00	0.00	0.00	0.00	7.69	0.00	0.00	0.00	8.33
50.00	64.29	90.91	77.78	76.92	75.00	70.00	72.73	53.85	100.00	72.73	7.14	91.67

CO-OP MINE
Trail Canyon
Shower House Ref Area
PJ/Sagebrush/Grass
Exposure: SE
Slope: 1 - 3 deg
Sample Date: 3 Sept 1993

39.00	40.00	Mean	SDev	Freq	
					TREES & SHRUBS
0.00	0.00	7.38	10.90	50.00	Artemisia tridentata
0.00	0.00	4.38	7.76	30.00	Ceratoides lanata
5.00	5.00	4.13	6.79	35.00	Gutierrezia sarothae
0.00	0.00	0.25	1.56	2.50	Opuntia polyacanta
0.00	0.00	0.75	4.68	2.50	Chrysothamnus nauseosus
					FORBS
0.00	0.00	0.38	1.73	5.00	Lepidium montanum
0.00	0.00	0.38	1.32	7.50	Machaeranthera canescens
0.00	0.00	0.13	0.78	2.50	Tragopogon dubius
0.00	0.00	0.13	0.78	2.50	Circium sp.
					GRASSES
10.00	10.00	12.25	10.95	72.50	Stipa comata
0.00	0.00	1.25	4.97	7.50	Bouteloua gracilis
5.00	25.00	13.00	9.60	77.50	Stipa hymenoides
30.00	0.00	9.50	12.79	52.50	Elymus salinus
					COVER
50.00	40.00	53.88	9.84		Total Living Cover
4.00	10.00	13.93	6.92		Litter
45.00	45.00	26.48	12.55		Bareground
1.00	5.00	5.73	3.77		Rock
					% COMPOSITION
10.00	12.50	29.75	22.27		Shrubs
0.00	0.00	2.18	6.57		Forbs
90.00	87.50	68.07	22.25		Grasses

Appendix 3-D

Tank Seam Access Road Vegetation

Introduction

The following pages are a copy of a report prepared by Patrick Collins, Ph.D., Biologist/Reclamation Specialist, of Mt. Nebo Scientific. The report presents an evaluation of the pre-disturbed vegetation in the area of the Tank Seam Access Road and pad and a comparison of the data to data collected for the selected reference area. The vegetation survey was performed in October, 1992, and the reference area was sampled in July, 1993.

VEGETATION SAMPLING
OF
PROPOSED DISTURBED
TANK SEAM ACCESS ROAD

Prepared by

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Report: Patrick Collins, Ph.D.

Fieldwork: Patrick Collins
Dean Collins

Report Date: March 1993
Fieldwork Date: October 1992

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VEGETATION SAMPLING OF THE PROPOSED DISTURBED TANK SEAM ACCESS ROAD

SCOPE

The purpose of this document is to provide baseline information of the existing vegetation of an area that is proposed for new disturbance.

INTRODUCTION

General Site Description

The CO-OP Mining Company has proposed to construct an access road in their permit area which will require disturbance to the native plant community. The proposed disturbance lies within Bear Canyon. Bear Canyon, a branch of Huntington Canyon, is located west of the city of Huntington in Emery County, Utah. Slopes that surround the canyon are primarily dominated by pinyon-juniper and mountain brush communities. In their native, undisturbed state, the canyon bottoms are comprised chiefly of

sagebrush/grass and riparian communities.

Bear Canyon maintains active mine facilities. Several areas have been disturbed as a result of the mine activities and some of these areas have been reclaimed and reseeded.

METHODS

Quantitative and qualitative data were taken on the sample sites. Sampling was accomplished in October 1992, before appreciable frost that could affect the results.

Transect Placement

The corridor of the proposed disturbed access road had been previously surveyed and flagged. Regular points at 50 ft intervals were located along the entire length of the proposed road. Sampling quadrats were placed at these points.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional information recorded on data sheets were: estimated precipitation, erosion,

slope, exposure, grazing use, animal disturbance and other appropriate notes.

Woody Species Density

Density of woody plant species were recorded using the point quarter distance method and by using belt transects. In the point quarter method, the aforementioned regular points were placed on the sample sites and delineated into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy

Sampling adequacy for woody species density and cover was achieved using formulas from "Statistical Methods" (Snedocor and Cochran 1980), with the goal that at least 80% of the samples were within 10% of the true mean for the plant communities of the area. The formula used is given below.

$$nmin = \left[\frac{1.28\ (s)}{x\ (.1)}\right]^2$$

where,

nmin = minimum adequate sample
s = standard deviation
x = sample mean
.1 = confidence interval

Photographs

Color photographs of the sample area were taken at the time of sampling and were submitted with this report.

Raw Data

The raw data were also submitted with this report which would facilitate future scrutiny of the data and further statistical testing if desired.

RESULTS

Rock was the major contingent for the ground cover and was estimated at 56.00%. Total living cover of the site was estimated at 19.50% (Table 2). Grasses dominated the cover and comprised of almost 75% of the living cover (Table 2). The dominate grass species was Salina wildrye (*Elymus salinus*) and was estimated at 10.58% cover. Mountain mahogany (*Cercocarpus ledifolius*) was the most common woody species followed by pinyon pine (*Pinus edulis*) and Utah Juniper (*Juniperus osteosperma*). For a list of cover by species, refer to Table 3.

Woody species density was estimated at 394 individuals per

acre (Table 4) by the point quarter method. Again, the most abundant species was mountain mahogany followed closely by pinyon pine.

TABLE 1:

CO-OP MINE AREA
QUALITATIVE SAMPLING DATA SHEET AND
QUANTITATIVE/QUALITATIVE NOTES
1992

SITE NAME: Reclaimed Pads

AREA: TRAIL CANYON

DATE: 10 October 1992

WORKERS: P. Collins, D. Collins

SLOPE: Approx. 30 deg.

EXPOSURE: N, E, S (predominately E)

ANIMAL USE/DISTURBANCE: Moderate deer use

EROSION: Slight

COVER: (see quantitative data)

DOMINANT PLANT SPECIES OBSERVED: (see quantitative data)

NOTES:

1) (see report)

TABLE 2: Total cover and composition summary for the Proposed Disturbed Tank Seam Access Road at the CO-OP Mine.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	19.50	6.87	40
Litter	12.13	13.95	40
Bareground	12.38	9.86	40
Rock	56.00	19.18	40
COMPOSITION			
Shrubs	25.46	37.45	40
Forbs	0.00	0.00	40
Grasses	74.54	37.45	40

TABLE 3: Species cover and frequency summary for the Proposed Disturbed Tank Seam Access Road at the CO-OP Mine.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Ceratoides lanata	2.13	5.11	40	20.00
Juniperus osteosperma	0.63	3.90	40	2.25
Pinus edulis	2.00	5.45	40	12.50
FORBS				
GRASSES				
Elymus cinereus	13.88	10.58	40	80.00
Stipa hymenoides	0.88	3.52	40	7.50

TABLE 4: Woody species densities of the Proposed Disturbed Tank Seam Access Road at the CO-OP Mine.

	NUMBER/ACRE
Cercocarpus ledifolius	177.08
Chrysothamnus nauseosus	14.76
Juniperus osteosperma	56.57
Pinus edulis	142.65
Pseudotsuga menziesii	2.46
TOTAL	393.51

COLOR PHOTOGRAPHS

SAMPLE AREAS FOR THE PROPOSED DISTURBED TANK SEAM ACCESS ROAD (OCT. 1992)

APPENDIX: RAW DATA

SITE: Tank Seam Access Road
(Proposed Disturbed)
AREA: CO-OP MINE - BEAR CANYON
SLOPE: 34 deg
EXPOSURE: N,E,S, Predominantly E
WORKERS: R & P Collins
DATE: 10 Oct 1992

	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
SHRUBS										
Pinus edulis	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00
Cercocarpus ledifolius	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Juniperus osterspema	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
GRASSES										
Elymus salinus	20.00	5.00	25.00	20.00	0.00	35.00	25.00	10.00	5.00	20.00
Stipa hymenoides	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Total Living Cover	20.00	25.00	25.00	20.00	10.00	35.00	25.00	15.00	25.00	20.00
Litter	5.00	5.00	50.00	10.00	5.00	40.00	5.00	5.00	25.00	5.00
Bareground	15.00	10.00	10.00	35.00	20.00	15.00	5.00	5.00	20.00	50.00
Rock	60.00	60.00	15.00	35.00	65.00	10.00	65.00	75.00	30.00	25.00
% COMPOSITION										
Shrubs	0.00	80.00	0.00	0.00	0.00	0.00	0.00	33.33	80.00	0.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	100.00	20.00	100.00	100.00	100.00	100.00	100.00	66.67	20.00	100.00

11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	15.00	0.00	0.00	0.00	10.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	25.00	0.00	5.00	35.00	25.00	5.00	10.00	20.00	25.00	10.00	0.00
0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
10.00	10.00	25.00	20.00	10.00	35.00	25.00	20.00	10.00	20.00	25.00	20.00	10.00
5.00	5.00	65.00	5.00	5.00	5.00	10.00	10.00	5.00	5.00	5.00	5.00	5.00
10.00	15.00	5.00	5.00	10.00	10.00	10.00	10.00	25.00	5.00	5.00	5.00	5.00
75.00	70.00	5.00	70.00	75.00	50.00	55.00	60.00	60.00	70.00	65.00	70.00	80.00
0.00	0.00	0.00	0.00	50.00	0.00	0.00	75.00	0.00	0.00	0.00	50.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	100.00	100.00	100.00	50.00	100.00	100.00	25.00	100.00	100.00	100.00	50.00	50.00

24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

25.00	0.00	30.00	20.00	10.00	5.00	10.00	10.00	10.00	25.00	20.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

25.00	25.00	30.00	20.00	20.00	10.00	10.00	10.00	10.00	25.00	20.00	20.00	15.00
10.00	10.00	5.00	5.00	45.00	3.00	10.00	2.00	25.00	5.00	10.00	20.00	5.00
5.00	5.00	20.00	5.00	5.00	2.00	25.00	3.00	20.00	10.00	5.00	20.00	30.00
60.00	60.00	45.00	70.00	30.00	85.00	55.00	85.00	45.00	60.00	65.00	40.00	50.00
0.00	100.00	0.00	0.00	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	100.00	100.00	50.00	50.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00

SITE: Tank Seam Access Road

AREA: CO-OP MINE - BEAR CANYON
SLOPE: 34 deg
EXPOSURE: N,E,S, Predominantly E
WORKERS: R & P Collins
DATE: 10 Oct 1992

37.00	38.00	39.00	40.00	Mean	StDev	Freq	
							SHRUBS
0.00	0.00	15.00	0.00	2.00	5.45	12.50	Pinus edulis
0.00	20.00	0.00	20.00	2.13	5.11	20.00	Cercocarpus ledifolius
0.00	0.00	0.00	0.00	0.63	3.90	2.25	Juniperus osterspema
							FORBS
							GRASSES
25.00	0.00	0.00	0.00	13.88	10.58	80.00	Elymus salinus
0.00	0.00	0.00	0.00	0.88	3.52	7.50	Stipa hymenoides
25.00	20.00	15.00	20.00	19.50	6.87		Total Living Cover
10.00	5.00	15.00	10.00	12.13	13.95		Litter
10.00	5.00	10.00	10.00	12.38	9.86		Bareground
55.00	70.00	60.00	60.00	56.00	19.18		Rock
							% COMPOSITION
0.00	100.00	100.00	100.00	25.46	37.45		Shrubs
0.00	0.00	0.00	0.00	0.00	0.00		Forbs
100.00	0.00	0.00	0.00	74.54	37.45		Grasses

VEGETATION STUDIES FOR THE FEDERAL LEASE AREA U-024316

1997

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August 1997

VEGETATION STUDIES FOR THE FEDERAL LEASE AREA U-024316

SCOPE

The purpose of this report is to provide vegetation information to the CO-OP Mining Company, information required by the USDA Forest Service. Emphasis of the vegetation study was to provide: 1) a survey for the sensitive plant, canyon sweetvetch (*Hedysarum occidentale* var. *canone*), and 2) a general description of the plant communities that exist on the federal lease area.

INTRODUCTION

CO-OP Mining Company has proposed to conduct underground mining activities within the boundaries of Federal Lease Area U-024316. The study area was located in Bear Creek Canyon, a tributary of Huntington Canyon and continues to portions at the top of Gentry Mountain. Other than the potential for subsidence in some areas, no disturbance will be made to the surface of the land in the lease area by mining activites.

This report provides a description of the general plant communities in the lease area. A species

list of the dominant plants has been provided for each community type. A survey was also conducted for the sensitive plant called canyon sweetvetch (*Hedysarum occidentale* var. *canone*).

METHODS

Field work was conducted to obtain the information contained in this report. Vegetation mapping was done using topographical maps and by walking the study area. Species lists were prepared at the same time the mapping was done.

The canyon sweetvetch study was done by walking the areas of potential habitat, counting the individual plants and recording the qualitative data reported herein.

RESULTS

Canyon Sweetvetch Survey

A survey was conducted for canyon sweetvetch (*Hedysarum occidentale* var. *canone*) on July 16, 1997. The survey was conducted in Bear Creek Canyon, a tributary of Huntington Creek in Emery County, Utah. The survey was located within (and adjacent to) the boundaries of Federal Lease U-024316 (W½ of Sec. 13, T16S, R7E).

Several populations of canyon sweetvetch were found in the drainage and adjacent slopes. Each

area where populations were present was identified on a field map and later transferred to the map included with this report (Plate 9F-1). Individual plants were counted in each area. Results from the counts are given in Table 1. Because the plant populations often showed no obvious changes to differentiate between populations, they could be considered a continuum rather than distinct population groups.

TABLE 1 - Numbers of individuals of canyon sweetvetch in upper Bear Creek Canyon.

Area	No. of Individuals	Area	No. of Individuals
1	150+	7	500+
2	200+	8	150+
3	300+	9*	500+
4	200+	10*	500+
5	500+	11*	500+
6	500+	*	Areas were located outside U-024316 boundaries.

Following is some qualitative information about the biology and environment associated with the populations of canyon sweetvetch located in upper Bear Creek Canyon.

Topographic Position - The plants were more concentrated near the drainage bottoms, but were also common on the slopes above the drainages.

Condition - The plants were healthy and did not appear to have herbivore damage.

Reproductive Data - The plants phenology was approximately 80% in flower and 20% fruit. Flowers and fruit were relatively less in these populations whn compared to populations observed the previous week in the Book Cliff Mountains, but the herbage was productive. No seedlings were observed in the general area or near the mature plants.

Associated Plant Communities - The populations located in the lower reaches of the study area (Areas 1-4) were found primarily in Pinyon-Juniper/Salina Wildrye communities. Plants common in this area were pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus utahensis*), salina wildrye (*Elymus salinus*), white fir (*Abies concolor*) and Douglas fir (*Pseudotsuga menziesii*). Further up the drainage similar plant communities existed (Areas 5-8), however, the dominant plant species changed to mountain spray (*Holodiscus dumosus*), leafybract aster (*Aster foliaceus*) and salina wildrye. Other areas of canyon sweetvetch communities were observed, reported, and included on the map, but were outside the federal lease area boundaries (Areas 9-11). These areas were also Primarily Pinyon-Juniper/Salina Wildrye communities.

Slope/Exposure - Canyon sweetvetch in this area was located on a variety of slopes but were mostly found on slopes ranging from 15 to 30 degrees. Slope exposure where the plant was found were east- and west-facing slopes, with a greater number probably on the east-facing slopes.

Geology/Parent Material - The plant was established in Castlegate Sandstone.

Apparent Threats to Populations - The only threat to the present populations would be due to

subsidence caused by underground mining activities.

Elevation - Elevation of the study area where canyon sweetvetch was observed ranged from 7,760 to 8,320 ft above sea level.

Photographs - Color photographs were taken of the area. Figure 1 shows a color photograph of the general habitat of the canyon sweetvetch in Bear Creek Canyon.

Figure 1

Bear Creek Canyon
Canyon Sweetvetch Habitat

Plant Communities of the Lease Area

Pinyon-Juniper/Salina Wildrye

Pinyon-Juniper/Salina Wildrye plant communities were common in the lease area. These communities were located primarily in the southern reaches of the lease area boundaries and were primarily on east- and west-facing slopes of Bear Creek Canyon (Plate 9F-1). Elevations of these communities were approximately 7,760 ft. to 8,100 ft. above sea level. Dominant plant species of this community have been listed in Table 2.

TABLE 2 - Dominant plant species of the Pinyon-Juniper/Salina Wildrye Community

SCIENTIFIC NAME	COMMON NAME
TREES & SHRUBS	
Abies concolor	White fir
Chrysothamnus viscidiflorus	Low rabbitbrush
Gutierrezia sarothrae	Snakeweed
Juniperus utahensis	Utah juniper
Pinus edulis	Pinyon pine
Pseudotsuga menziesii	Douglas Fir
FORBS	
Aster glaucodes	Blueleaf aster
GRASSES	
Elymus salinus	Salina wildrye
Stipa hymenoides	Indian ricegrass

Mountain Spray/Salina Wildrye

Further north and upstream from the Pinyon-Juniper/Salina Wildrye community in the Bear Creek drainage, a less common community existed. This community could be called a Mountain Spray/Salina Wildrye community. With many of the same species as the aforementioned community, it had a large component of the shrub, mountain spray (*Holodiscus dumosus*). Dominant plant species are listed in Table 3. Elevations of this community ranged from approximately 8,000 ft to 8,400 ft above sea level.

TABLE 3 - Dominant plant species of the Mountain Spray/Salina Wildrye Community

SCIENTIFIC NAME	COMMON NAME
TREES & SHRUBS	
Abies concolor	White fir
Chrysothamnus viscidiflorus	Low rabbitbrush
Gutierrezia sarothrae	Snakeweed
Holodiscus dumosus	Mountain spray
Juniperus utahensis	Utah juniper
Pinus edulis	Pinyon pine
Pseudotsuga menziesii	Douglas Fir
FORBS	
Aster glaucodes	Blueleaf aster
Oenothera caespitosa	Evening primrose
GRASSES	
Elymus salinus	Salina wildrye
Stipa hymenoides	Indian ricegrass

Sagebrush/Mountain Brome

In the upper elevations of Gentry Mountain and on more flat plateau tops, a Sagebrush/Mountain Brome community can be found. The species composition of this community changes, but could be described as a more "open" community ranging from shrublands to mountain herblands. Elevations of these communities ranged from 9,100 ft to nearly 9,400 ft above sea level. A list of dominant plant species for these areas is shown in Table 4.

TABLE 4 - Dominant plant species of the Sagebrush/Mountain Brome Community

SCIENTIFIC NAME	COMMON NAME
TREES & SHRUBS	
Artemisia tridentata var. vaseyana	Vasey sagebrush
Cercocarpus ledifolius	Mountain mahogany
FORBS	
Achillea millefolium	Yarrow
Calochortus nuttallii	Sego lily
Chaenactis douglasii	Dusty-maiden
Delphinium nelsonii	Larkspur
Eriogonum ovalifolium	Cushion buckwheat
Geranium viscosissimum	Sticky geranium
Orthocarpus tolmiei	Owl-clover
Potentilla diversifolia	Wedge-leaf cinquefoil
GRASSES	
Bromus carinatus	Mountain brome
Festuca ovina	Sheep fescue

Aspen/Mountain Brome

An Aspen/Mountain Brome community was also found in the lease area. Elevation of this community was about 9,200 ft. A species list is shown on Table 5.

TABLE 5 - Dominant plant species of the Aspen/ Mountain Brome Community

SCIENTIFIC NAME	COMMON NAME
TREES & SHRUBS	
Abies lasiocarpa	Subalpine fir
Chrysothamnus viscidiflorus	Low rabbitbrush
Juniperus communis	Common juniper
Picea pungens	Blue spruce
Populus tremuloides	Aspen
Pseudotsuga menziesii	Douglas Fir
Ribes cereum	Squaw current
Rosa woodsii	Wood's rose
Symphoricarpos oreophilus	Snowberry
FORBS	
Aquilega caerulea	Colorado columbine
Erigeron sp.	Daisy
Erysimum asperum	Wallflower
Fragaria vesca	Wild strawberry
Geranium viscosissimum	Sticky geranium
Hackelia floribunda	Showy stick-seed
Lupinus sericeus	Silky lupine
Penstemon sp.	Penstemon
Swertia radiata	Elkweed
Vicia americana	American vetch
GRASSES	
Bromus carinatus	Mountain brome

Douglas Fir/Snowberry

The Douglas Fir/Snowberry community was a major community in the lease area. This community had relatively low species diversity with few understory species. Depending on the location, other conifer trees were also important in this community, but Douglas Fir was usually the dominant species.

Elevations of this community ranged from approximately 8,400 ft to 9,300 ft. A list of species is shown on Table 6.

TABLE 6 - Dominant plant species of the Douglas Fir/Snowberry Community

SCIENTIFIC NAME	COMMON NAME
TREES & SHRUBS	
Abies concolor	White Fir
Abies lasiocarpa	Subalpine Fir
Picea pungens	Blue Spruce
Pseudotsuga menziesii	Douglas Fir
Sambucus caerulea	Elderberry
Symphoricarpos oreophilus	Snowberry
FORBS	
Penstemon sp.	Penstemon
GRASSES	
Bromus carinatus	Mountain brome

CONCLUSIONS

As one will note from the numbers of individuals of canyon sweetvetch located in Bear Creek Canyon, the plant is quite abundant and widespread. Subsidence-caused surface disturbances, if relatively small acreages are concerned, should not significantly impact the populations of the plant in the area.

General community types have been described and mapped for this report. The relative sizes of each community (from the greatest area to the least) were as follows: 1) Douglas Fir/Snowberry, 2) Pinyon-Juniper/Salina Wildrye, 3) Sagebrush/Mountain Brome, 4) Aspen/Mountain Brome, and 5) Mountain Spray/Salina Wildrye.

Vegetation Sampling In The Wild Horse Ridge Area

Appendix 3-F

VEGETATION SAMPLING IN THE WILDHORSE RIDGE AREA

1996

A Comparison Between:
The Proposed Disturbed Conveyor Corridor,
New Portal Area, and Reference Area

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Report Date: April 1997
Fieldwork Date: August 1996

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VEGETATION SAMPLING IN THE WILDHORSE RIDGE AREA

1996

SCOPE

The purpose of this document is to describe and provide quantitative and qualitative data for an area that has been proposed for future disturbance by coal mining activities. An area chosen for comparison, and to represent the standard for revegetation success for the disturbed area once mining activities seize and the land is reclaimed, has also been studied.

INTRODUCTION

The CO-OP Mining Company has planned expansion to their mining operations in the Wildhorse Ridge area. Disturbance to plant communities would occur due to construction of a conveyor system and portal area.

Elevation of the study area ranged from 7,500 ft to 8,500 ft above sea level. The study area was located in Bear Canyon, a branch of Huntington Canyon in Emery County, Utah. General plant community types at and adjacent to the areas that are proposed for disturbance were: pinyon-

juniper, Salina wildrye, mountain brush, ponderosa pine, sagebrush/grass, and limited riparian communities.

METHODS

The State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (DOGM) provided guidelines for some of the sample methodologies used in this report. Quantitative and qualitative data were taken on the vegetation of the proposed disturbed and reference areas in the Wildhorse Ridge area. Sampling was conducted in early August 1996.

Proposed Disturbed Area

The area surveyed for disturbance was primarily along a proposed new conveyance corridor and terminates at a new portal area. Areas along the proposed route of the conveyor and portal were sampled. More information is given about the plant communities and provides additional insight about the sampling methods in the RESULTS section below.

Reference Area

A reference area to be used as a standard for revegetation success at the time of final reclamation was selected. The reference area was dominated by similar plant species as the proposed disturbed areas. The reference area was chosen to comply with guidelines provided by DOGM

and was estimated to have similar slopes, soils, species composition, precipitation, elevation and other environmental variables.

Due to the heterogeneity of the proposed disturbed area (see RESULTS, Proposed Disturbed Area), an exact duplication for a reference area was difficult to locate. One area was recommended for consideration by a DOGM biologist. This area was the site used for another reference area for previous disturbances by the CO-OP Mining Company (Showerhouse Reference Area), so quantitative data was available. When these data were compared to the preliminary field data, it appeared that the differences (especially for cover) would have been significant.

Another area was then considered for a reference area to the proposed disturbed areas. The area was much closer to the proposed disturbed areas (near an archeological site), but due to changes in exposure and soils (especially the proximity of the bedrock to the surface), cover would have obviously been significantly less than the proposed disturbed area.

A third area was considered that was also in relatively close proximity to the proposed disturbed areas, but was on the other side of the drainage with different exposure to the sun.. However, because the community was more similar and also had transitional attributes, it appeared to be the logical choice that most closely represented the areas chosen for potential disturbance. More information about this community is given in the RESULTS section of this document.

Transect and Quadrat Placement

Transect lines for sampling were placed randomly along the proposed conveyor corridor and portal areas. Stratified random placement of sampling quadrats were designed to provide *subjective sampling without preconceived bias.* Once the transect lines were placed, regular points were then marked on them. From these marks, a random number dictated the direction and distance to place the quadrats at right angles from the transect lines. Vegetation sampling methodologies between the proposed disturbed and the reference areas were consistent.

Cover and Composition

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

Frequency

Frequency was calculated for each plant species and represents the relative number of times that a given species occurred in the square meter quadrats.

Woody Species Density

Density of woody plant species were recorded using the point quarter distance method (Cottom and Curtis 1956). In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy & Statistical Comparisons

As recommended by DOGM guidelines, sampling adequacy was calculated using formulas from Cochran (1977), with the goal of 80% confidence level with a 10% change in mean (two-tailed t-value was used). The formula used is given below.

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

where,

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

Student's t-tests were employed to compare the proposed disturbed and reference areas of the sites for cover, and density. All sample means, standard deviations, and sample sizes were

included in this report to enable the reviewers to check or apply further statistical tests if desired.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been included with this report.

Raw Data

The raw data have been summarized on spreadsheets and have also been included in the Appendix.

RESULTS

Proposed Disturbed Area

The area planned for disturbance begins on a proposed conveyor corridor route. Near the beginning of this conveyor system, other small disturbance sites are also planned (i.e. topsoil stockpile area). The proposed new conveyor will continue up the canyon and terminate at a new portal site. Sample areas were chosen along the proposed route of the conveyor and in the portal area. Engineering designs for the conveyor show no disturbance is planned for the bottom of the drainage itself with the exception of one very small area that is less that 1 acre in size. Therefore,

sampling was focused on the proposed conveyor corridor (and not the drainage bottoms) to more accurately assess those areas that will most likely be disturbed. Much of the proposed corridor runs adjacent to an existing road, so some of the area that is proposed for new disturbance has already been somewhat disturbed previously. Sampling, however, was restricted to those areas that were not previously disturbed by the road or any other man-caused activities.

The proposed disturbed sites of the Wildhorse Ridge area were quite variable for several reasons. Most notably, the conveyor corridor has been designed to be placed near the bottom of the drainage and advances to a distance on one side or the other of the drainage (see PHOTOGRAPHS). With the changes in topography, soils, exposure and proximity to the drainage bottoms, there is a considerable amount of diversity in species and composition. Although the proposed disturbed areas were heterogeneous, they probably were not dissimilar enough in the appropriate parameters to warrant separating data for the summaries. However, the methods used to record and summarize these data provide opportunities to do so if found necessary in the future.

Total living cover (overstory plus understory) of the proposed disturbed sites of the Wildhorse Ridge area was estimated to be 42.50%. Understory comprised 34.00% of that cover (Table 1). The understory composition was dominated by grasses or provided 73.71% of the cover, whereas, woody species were 23.40% and forbs 2.89%, respectively (Table 1).

The dominant plant species was Salina wildrye (*Elymus salinus*) which comprised 15.83% cover,

followed distantly by needle-and-thread grass (*Stipa comata*), Utah Juniper (*Juniperus osteosperma*), smooth brome (*Bromus inermis*) and white fir (*Abies concolor*). For cover and frequency summaries, refer to Table 2.

Woody species densities were also estimated in the area. Total woody species density was estimated at 1,010 individuals per acre (Table 3). The dominant woody species by density were: big sagebrush (*Artemisia tridentata*), pinyon pine (*Pinus edulis*), black sagebrush (*Artemisia nova*), mountain mahogany (*Cercocarpus ledifolius*), and Utah juniper (*Juniperus osteosperma*).

Reference Area

As mentioned in the METHODS section above, several areas were considered to be used for future revegetation success standards. The area chosen comprised of plant communities transitional between the lower drainage area and the pinyon-juniper/grass areas commonly found on the upland slopes (see PHOTOGRAPHS). The transect lines were stratified to intentionally included some communities common near the drainage (i.e. conifers), pinyon-juniper stands, and the open interspaces between them where grasses were more common.

Total living cover of the reference area was estimated to be 46.25%, where most of it was provided by the understory at 37.25%. Like the proposed disturbed areas, grasses dominated the cover comprising 42.23% of the cover, but more equally represented by shrubs (35.39%) and forbs (22.37%). Total cover and understory composition summaries are shown on Table 5.

Again, similar to the proposed disturbed areas, the most common plant species was Salina wildrye (*Elymus salinus*), followed by corymbed buckwheat (*Eriogonum corymbosum*), rubber rabbitbrush (*Chrysothamnus nauseosus*) , bluegrass (*Poa pratensis*), and hoary aster (*Machaeranthera canescens*). For cover and frequency by species, refer to Table 6.

Density of woody species for the reference area proved to be higher than the proposed disturbed areas estimated at 1,405 individuals per acre (Table 7). Dominant plants for this parameter were corymbed buckwheat (*Eriogonum corymbosum*), Douglas fir (*Pseudotsuga menziesii*), pinyon pine (*Pinus edulis*), low rabbitbrush (*Chrysothamnus viscidiflorus*), and Utah juniper (*Juniperus osteosperma*).

DISCUSSION

Statistical Comparisons

Student's t-tests suggest that there was no statistical difference for cover when the proposed disturbance was compared with the reference area (Table 8). Although woody species density was quite high in both areas, statistical tests imply that the reference area was significantly greater than the proposed disturbed areas. As mentioned in the RESULTS, understory composition of the reference area was more equally represented by woody species, forbs and grasses.

Sensitive Plant Species

Mention should be made to the fact that there were several individuals of canyon sweetvetch (*Hedysarum occidentalis* var. *canone*) within the boundaries of the proposed disturbed area, especially on the slopes and small drainage ways near the beginning of the proposed conveyor (near the area where topsoil stockpiles and other disturbances are planned).

Although, not officially listed as "threatened" or "endangered", canyon sweetvetch is an endemic to the area and protection from disturbance is recommended.

TABLE 1: Total cover and composition summary for the proposed disturbed conveyor corridor of the Wildhorse Ridge area (1996).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Overstory Cover (O)	8.50	14.61	30
Understory Cover (U)	34.00	11.79	30
Litter	23.17	13.87	30
Bareground	18.16	14.27	30
Rock	16.16	12.71	30
Total Living Cover (O+U)	42.50	10.31	30

UNDERSTORY COMPOSITION			
Woody spp.	23.40	28.39	30
Forbs	2.89	11.49	30
Grasses	73.71	29.12	30

TABLE 2: Species cover and frequency summary for the understory of the proposed disturbed conveyor corridor of the Wildhorse Ridge area (1996).

SPECIES	% MEAN COVER	STANDARD DEVIATIONS	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Abies concolor	1.33	5.62	30	10.00
Artemisia nova	1.33	3.86	30	13.33
Artemisia tridentata	0.67	2.13	30	10.00
Cercocarpus ledifolius	0.67	2.49	30	6.67
Echinocereus triglochidiatus	0.17	0.90	30	3.33
Gutierrezia sarothrae	0.17	0.90	30	3.33
Juniperus osteosperma	2.33	8.83	30	6.67
Opuntia polyacantha	0.40	1.28	30	10.00
Pinus edulis	0.83	2.61	30	10.00
Pseudotsuga menziesii	0.67	2.13	30	10.00
FORBS				
Erigeron sp.	0.10	0.54	30	3.33
Medicago sativa	0.83	4.49	30	3.33
Mirabilis linearis	0.17	0.90	30	3.33
GRASSES				
Agropyron cristatum	0.83	2.91	30	10.00
Bromus inermis	1.50	4.86	30	13.33
Elymus salinus	15.83	15.00	30	70.00
Poa pratensis	0.67	2.13	30	10.00
Stipa comata	4.83	0.92	30	26.67
Stipa hymenoides	0.67	2.49	30	6.67

TABLE 3: Woody species densities of the proposed disturbed conveyor corridor of the Wildhorse Ridge area (1996).

	NUMBER/ACRE	SAMPLE SIZE
Abies concolor	67.34	30
Artemisia nova	134.68	30
Artemisia tridentata	176.76	30
Ceratoides lanata	8.42	30
Cercocarpus ledifolius	123.26	30
Echinocereus triglochidiatus	8.42	30
Gutierrezia sarothrae	50.50	30
Juniperus osteosperma	109.43	30
Juniperus scopulorum	8.41	30
Opuntia polyacantha	42.09	30
Pinus edulis	159.93	30
Pinus ponderosa	33.67	30
Pseudotsuga menziesii	58.92	30
Salix sp.	25.25	30
TOTAL	1010.18	30

TABLE 5: Total cover and composition summary for the pinyon-juniper reference area of the Wildhorse Ridge area (1996).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Overstory Cover (O)	9.00	16.17	20
Understory Cover (U)	37.25	16.01	20
Litter	17.11	12.45	20
Bareground	12.24	8.54	20
Rock	24.40	15.65	20
Total Living Cover (O+U)	46.25	12.74	20
UNDERSTORY COMPOSITION			
Woody spp.	35.39	32.21	20
Forbs	22.37	24.54	20
Grasses	42.23	30.99	20

TABLE 6: Species cover and frequency summary for the understory of the reference area in the Wildhorse Ridge area (1996).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Abies concolor	1.50	4.77	20	5.00
Chrysothamnus nauseosus	2.75	5.58	20	25.00
Eriogonum corymbosum	4.00	7.35	20	30.00
Gutierrezia sarothrae	0.50	2.18	20	5.00
Juniperus osteosperma	0.50	2.18	20	5.00
Pinus edulis	1.00	3.39	20	10.00
Pseudotsuga menziesii	1.50	4.77	20	10.00
FORBS				
Artemisia ludoviciana	0.25	1.09	20	5.00
Castilleja chromosa	0.25	1.09	20	5.00
Circium sp.	1.75	2.86	20	30.00
Eriogonum sp.	0.25	1.09	20	5.00
Machaeranthera canescens	2.10	3.97	20	30.00
Townsendia incana	2.00	3.67	20	25.00
GRASSES				
Elymus salinus	14.65	14.99	20	75.00
Elymus spicatus	2.00	6.62	20	10.00
Poa pratensis	2.25	4.02	20	25.00

TABLE 7: Woody species densities of the pinyon-juniper reference area in the Wildhorse Ridge area (1996).

	NUMBER/ACRE	SAMPLE SIZE
Abies concolor	87.80	20
Artemisia tridentata	17.56	20
Chrysothamnus nauseosus	17.56	20
Chrysothamnus viscidiflorus	210.72	20
Eriogonum corymbosum	456.57	20
Gutierrezia sarothrae	35.12	20
Juniperus osteosperma	122.92	20
Pinus edulis	210.72	20
Pseudotsuga menziesii	245.84	20
TOTAL	1404.81	20

TABLE 8: Statistical summary sheet for the proposed disturbed and reference areas in the Wildhorse Ridge area (1996).

PROPOSED DISTURB AREAS				
Living Cover*	x=42.50	s=10.31	n=30	nMIN=9.64
Density**	x=6210.07	s=2958.79	n=30	nMIN=6.10
REFERENCE AREA				
Living Cover*	x=46.25	s=12.74	n=20	nMIN=12.43
Density	x=4465.09	s=1883.85	n=20	nMIN=5.40
STATISTICAL ANALYSES				
Living Cover	t=-0.514	df=21	SL=NS	
Density	t=2.336	df=48	SL=p<.05	

x = sample mean, s = sample standard deviation,
n = sample size, nMIN = minimum adequate sample,
NS = nonsignificant, t = Student's t-value, p=probability level
df = degrees of freedom, SL = significance level,
* represents understory and overstory cover combined.
** numbers represent the average point-to-individual distance squared (for densities, refer to RESULTS section).

COLOR PHOTOGRAPHS

PROPOSED DISTURBED AREAS OF WILDHORSE RIDGE

REFERENCE AREAS OF WILDHORSE RIDGE

APPENDIX

Raw Data

Wildhorse Ridge Conveyer
Proposed Disturbed
JP/Grass Conifer Transition
Exposure: SSW
Slope: 10 - 25 deg
Sample Date: 8 Aug 1996

1 thru 20 (West end of Conveyer, Road & Topsoil Storage)

	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
TREES & SHRUBS									
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia nova	15.00	5.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00
Opuntia polyacantha	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Abies concolor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Echinocereus triglochidiat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cercocarpus ledifolius	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS									
Erigeron sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mirabilis linearis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medicago sativa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
Poa pratensis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
Stipa hymenoides	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa comata	0.00	25.00	5.00	45.00	5.00	0.00	0.00	0.00	0.00
Elymus salinus	15.00	0.00	0.00	0.00	0.00	5.00	55.00	50.00	35.00
Bromus inermis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agropyron cristatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER									
Understory (U)	35.00	30.00	35.00	45.00	5.00	5.00	55.00	50.00	40.00
Litter	5.00	20.00	20.00	25.00	90.00	90.00	43.00	20.00	20.00
Bareground	45.00	40.00	25.00	20.00	4.00	4.00	1.00	20.00	25.00
Rock	15.00	10.00	20.00	10.00	1.00	1.00	1.00	10.00	15.00
Overstory (O)	0.00	0.00	0.00	0.00	45.00	45.00	0.00	0.00	0.00
Total Living Cover (U+O)	35.00	30.00	35.00	45.00	50.00	50.00	55.00	50.00	40.00
% COMPOSITION (U)									
Shrubs	57.14	16.67	57.14	0.00	0.00	0.00	0.00	0.00	0.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	42.86	83.33	42.86	100.00	100.00	100.00	100.00	100.00	100.00
Litter+BG+Rock	65.00	70.00	65.00	55.00	95.00	95.00	45.00	50.00	60.00
Total Living Cover (U+O)	35.00	30.00	35.00	45.00	50.00	50.00	55.00	50.00	40.00
Litter w/ factor	5.00	20.00	20.00	25.00	47.37	47.37	43.00	20.00	20.00
Bareground w/factor	45.00	40.00	25.00	20.00	2.11	2.11	1.00	20.00	25.00
Rock w/factor	15.00	10.00	20.00	10.00	0.53	0.53	1.00	10.00	15.00

10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00	5.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	15.00	35.00	0.00	10.00	0.00
25.00	25.00	10.00	0.00	30.00	0.00	0.00	0.00	15.00	25.00	30.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	35.00	25.00	50.00	35.00	35.00	30.00	45.00	35.00	50.00	35.00
63.00	62.00	60.00	25.00	5.00	5.00	15.00	20.00	20.00	10.00	20.00
1.00	2.00	10.00	20.00	35.00	50.00	45.00	25.00	25.00	25.00	25.00
1.00	1.00	5.00	5.00	25.00	10.00	10.00	10.00	20.00	15.00	20.00
20.00	40.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55.00	75.00	35.00	50.00	35.00	35.00	30.00	45.00	35.00	50.00	35.00
28.57	28.57	60.00	90.00	14.29	85.71	6.67	22.22	42.86	30.00	14.29
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	14.29	0.00	0.00
71.43	71.43	40.00	10.00	85.71	14.29	83.33	77.78	42.86	70.00	85.71
65.00	65.00	75.00	50.00	65.00	65.00	70.00	55.00	65.00	50.00	65.00
55.00	75.00	35.00	50.00	35.00	35.00	30.00	45.00	35.00	50.00	35.00
43.62	23.85	52.00	25.00	5.00	5.00	15.00	20.00	20.00	10.00	20.00
0.69	0.77	8.67	20.00	35.00	50.00	45.00	25.00	25.00	25.00	25.00
0.69	0.38	4.33	5.00	25.00	10.00	10.00	10.00	20.00	15.00	20.00

21 thru 30 (East end of Conveyer)

21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.00	Mean
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33
0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	2.33
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.83
20.00	0.00	5.00	30.00	25.00	15.00	15.00	5.00	25.00	15.00	15.83
10.00	25.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50
5.00	15.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
45.00	40.00	40.00	35.00	25.00	15.00	25.00	35.00	25.00	25.00	34.00
15.00	40.00	10.00	20.00	5.00	25.00	30.00	45.00	45.00	10.00	29.43
5.00	5.00	25.00	5.00	20.00	10.00	15.00	10.00	5.00	20.00	18.90
35.00	15.00	25.00	40.00	50.00	50.00	30.00	10.00	25.00	45.00	17.67
0.00	0.00	0.00	0.00	0.00	30.00	35.00	10.00	10.00	10.00	8.50
45.00	40.00	40.00	35.00	25.00	45.00	60.00	45.00	35.00	35.00	42.50
22.22	0.00	0.00	0.00	0.00	0.00	0.00	85.71	0.00	40.00	23.40
0.00	0.00	62.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.89
77.78	100.00	37.50	100.00	100.00	100.00	100.00	14.29	100.00	60.00	73.71
55.00	60.00	60.00	65.00	75.00	85.00	75.00	65.00	75.00	75.00	66.00
45.00	40.00	40.00	35.00	25.00	45.00	60.00	45.00	35.00	35.00	42.50
15.00	40.00	10.00	20.00	5.00	16.18	16.00	38.08	39.00	8.67	23.17
5.00	5.00	25.00	5.00	20.00	6.47	8.00	8.46	4.33	17.33	18.16
35.00	15.00	25.00	40.00	50.00	32.35	16.00	8.46	21.67	39.00	16.16

Wildhorse Ridge Conveyer
Proposed Disturbed
JP/Grass Conifer Transition
Exposure: SSW
Slope: 10 - 25 deg
Sample Date: 8 Aug 1996

SDev	Freq	
		TREES & SHRUBS
2.13	10.00	Artemisia tridentata
3.86	13.33	Artemisia nova
1.28	10.00	Opuntia polyacantha
0.90	3.33	Gutierrezia sarothrae
2.61	10.00	Pinus edulis
5.62	10.00	Abies concolor
8.83	6.67	Juniperus osteosperma
2.13	10.00	Pseudotsuga menziesii
0.90	3.33	Echinocereus triglochidiatus
2.49	6.67	Cercocarpus ledifolius
		FORBS
0.54	3.33	Erigeron sp.
0.90	3.33	Mirabilis linearis
4.49	3.33	Medicago sativa
		GRASSES
2.13	10.00	Poa pratensis
2.49	6.67	Stipa hymenoides
10.92	26.67	Stipa comata
15.00	70.00	Elymus salinus
4.86	13.33	Bromus inermis
2.91	10.00	Agropyron cristatum
		COVER
11.79		Understory (U)
23.06		Litter
13.78		Bareground
14.28		Rock
14.61		Overstory (O)
10.31		Total Living Cover (U+O)
		% COMPOSITION (U)
28.39		Shrubs
11.49		Forbs
29.12		Grasses
11.79		Litter+BG+Rock
10.31		Total Living Cover (U+O)
13.87		Litter w/ factor
14.27		Bareground w/factor
12.71		Rock w/factor

CO-OP MINING
ldhorse Ridge
Reference Area
PJ/Grasses
Exposure: NW
Slope: 29 deg
Sample Date: 8 Aug 1996

	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00
TREES & SHRUBS									
Abies concolor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum corymbosum	15.00	0.00	25.00	0.00	20.00	0.00	5.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus nauseosu	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	10.00
Juniperus osteosperma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS									
Townsendia incana	10.00	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canesce	0.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	0.00
Castilleja chromosa	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Circium sp.	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00
Artemisia ludoviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Enogonum sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES									
a pratensis	5.00	10.00	0.00	10.00	0.00	0.00	10.00	10.00	0.00
lymus salinus	25.00	35.00	0.00	5.00	25.00	35.00	35.00	55.00	10.00
mus spicatus	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	25.00
COVER									
Understory (U)	60.00	55.00	55.00	35.00	50.00	40.00	55.00	65.00	50.00
Litter	10.00	10.00	15.00	5.00	5.00	15.00	10.00	25.00	25.00
Bareground	20.00	10.00	5.00	5.00	10.00	5.00	15.00	5.00	5.00
Rock	10.00	25.00	25.00	55.00	35.00	40.00	20.00	5.00	20.00
Overstory (O)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Living Cover (U+O)	60.00	55.00	55.00	35.00	50.00	40.00	55.00	65.00	50.00
% COMPOSITION (U)									
Shrubs	33.33	0.00	63.64	0.00	40.00	0.00	18.18	0.00	20.00
Forbs	16.67	18.18	9.09	57.14	10.00	12.50	0.00	0.00	10.00
Grasses	50.00	81.82	27.27	42.86	50.00	87.50	81.82	100.00	70.00
Litter+BG+Rock	40.00	45.00	45.00	65.00	50.00	60.00	45.00	35.00	50.00
Total Living Cover (U+O)	60.00	55.00	55.00	35.00	50.00	40.00	55.00	65.00	50.00
Litter w/ factor	10.00	10.00	15.00	5.00	5.00	15.00	10.00	25.00	25.00
areground w/factor	20.00	10.00	5.00	5.00	10.00	5.00	15.00	5.00	5.00
ck w/factor	10.00	25.00	25.00	55.00	35.00	40.00	20.00	5.00	20.00

10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	20.00
0.00	0.00	0.00	10.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
5.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	2.00	5.00	0.00	0.00	15.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	5.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	8.00	10.00	0.00	15.00	10.00	5.00	0.00	0.00	10.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	35.00	30.00	10.00	20.00	25.00	25.00	10.00	25.00	25.00	45.00
5.00	5.00	25.00	45.00	45.00	5.00	65.00	25.00	30.00	65.00	5.00
20.00	40.00	20.00	20.00	10.00	15.00	5.00	40.00	25.00	5.00	10.00
45.00	20.00	25.00	25.00	25.00	55.00	5.00	25.00	20.00	5.00	40.00
0.00	0.00	0.00	40.00	0.00	0.00	25.00	50.00	30.00	35.00	0.00
30.00	35.00	30.00	50.00	20.00	25.00	50.00	60.00	55.00	60.00	45.00
66.67	57.14	33.33	100.00	0.00	0.00	80.00	0.00	80.00	60.00	55.56
33.33	20.00	33.33	0.00	25.00	60.00	0.00	100.00	20.00	0.00	22.22
0.00	22.86	33.33	0.00	75.00	40.00	20.00	0.00	0.00	40.00	22.22
70.00	65.00	70.00	90.00	80.00	75.00	75.00	90.00	75.00	75.00	55.00
30.00	35.00	30.00	50.00	20.00	25.00	50.00	60.00	55.00	60.00	45.00
5.00	5.00	25.00	25.00	45.00	5.00	43.33	11.11	18.00	34.67	5.00
20.00	40.00	20.00	11.11	10.00	15.00	3.33	17.78	15.00	2.67	10.00
45.00	20.00	25.00	13.89	25.00	55.00	3.33	11.11	12.00	2.67	40.00

CO-OP MINING
Wildhorse Ridge
Reference Area
PJ/Grasses
Exposure: NW
Slope: 29 deg
Sample Date: 8 Aug 1996

Mean	SDev	Freq	
			TREES & SHRUBS
1.50	4.77	5.00	Abies concolor
1.50	4.77	10.00	Pseudotsuga menziesii
1.00	3.39	10.00	Pinus edulis
4.00	7.35	30.00	Eriogonum corymbosum
0.50	2.18	5.00	Gutierrezia sarothrae
2.75	5.58	25.00	Chrysothamnus nauseosus
0.50	2.18		Juniperus osteosperma
			FORBS
2.00	3.67	25.00	Townsendia incana
2.10	3.97	30.00	Machaeranthera canescens
0.25	1.09	5.00	Castilleja chromosa
1.75	2.86	30.00	Circium sp.
0.25	1.09	5.00	Artemisia ludoviciana
0.25	1.09	5.00	Eriogonum sp.
			GRASSES
2.25	4.02	25.00	Poa pratensis
14.65	14.99	75.00	Elymus salinus
2.00	6.20	10.00	Elymus spicatus
			COVER
37.25	16.01		Understory (U)
22.00	18.87		Litter
14.50	10.59		Bareground
26.25	14.57		Rock
9.00	16.17		Overstory (O)
46.25	12.74		Total Living Cover (U+O)
			% COMPOSITION (U)
35.39	32.21		Shrubs
22.37	24.54		Forbs
42.23	30.99		Grasses
62.75	16.01		Litter+BG+Rock
46.25	12.74		Total Living Cover (U+O)
17.11	12.45		Litter w/ factor
12.24	8.54		Bareground w/factor
24.40	15.65		Rock w/factor

BIOMASS PRODUCTION OF THE WILDHORSE RIDGE AREA

1999

A Comparison Between:
The Proposed Disturbed Conveyor Corridor,
New Portal Area, and Reference Area

Prepared by

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Report: Patrick Collins, Ph.D.

Report Date: November 1999
Fieldwork Date: August 1999

BIOMASS PRODUCTION OF THE WILDHORSE RIDGE AREA

1999

SCOPE

The purpose of this report is to provide biomass productivity for the plant communities in the Wildhorse Ridge area that are proposed for disturbance by the CO-OP Mining Company. Biomass production data for a Reference Area have also been submitted.

INTRODUCTION

Previously, vegetation sampling was conducted in August 1996 as a means to quantify plant communities that could be impacted by a proposed mine expansion by the CO-OP Mining Company. The planned expansion of their mining operations is located in the Wildhorse Ridge area. Disturbance to plant communities would occur due to construction of a conveyor system and portal area. A final report was provided to the CO-OP Mining Company in April 1997 that showed results from the vegetation sampling (see "*Vegetation Sampling in the Wildhorse Ridge Area: 1996*").

General descriptions of the study areas and selection of the Reference Area were discussed in the 1996-97 report and will not be described again in this report. The purpose of this report is to provide additional quantitative data to augment the data in the earlier report. Quantitative data

reported in the 1996-97 report included total cover, cover by species, understory composition, frequency and woody species density. This report provides results from annual biomass productivity for the area proposed for disturbance by expansion of the current mining activities. It also provides data for Reference Area that has been chosen as a revegetation success standard at the time of final reclamation. Justifications for selection of the Reference Area were outlined in the 1996-97 report.

METHODS

The State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (DOGM) provided guidelines for some of the sample methodologies used in this report. Productivity data were taken on the vegetation of the proposed disturbed and Reference Area in the Wildhorse Ridge area. Sampling was conducted in August 1999.

Proposed Disturbed Area

The area surveyed for disturbance was primarily along a proposed new conveyance corridor and terminates at a new portal area. Areas along the proposed route of the conveyor and portal were sampled.

Transect and Quadrat Placement

Transect lines for sampling production were placed randomly along the proposed conveyor corridor and portal areas. Stratified random placement of sampling quadrats were designed to provide *subjective sampling without preconceived bias*. Once the transect lines were placed, regular points were then marked on them. From these marks, a random number dictated the direction and distance to place the quadrats at right angles from the transect lines. Vegetation sampling methodologies between the proposed disturbed and the reference areas were consistent with each other and also with the 1996 methods described in the 1997 report.

Production Measurements

Total annual biomass production was measured by clipping, drying and weighing current annual growth. "Double sampling" using four quadrats estimated around the clipped and weighed plot was implemented.

Photographs

Color photographs of the sample areas were taken at the time of sampling, but have *not* been included in this report. These photographs are available upon request.

RESULTS

Proposed Disturbed Area

Annual biomass production for the area proposed for disturbance in the conveyor and portal areas was 125.31 pounds and 122.37 pounds per acre for the herbaceous and woody species, respectively. The total annual biomass for the proposed disturbed area was 247.68 pounds per acre (Table 1).

Reference Area

Total annual biomass production for the Reference Area or area chosen to be the standard of success at the time of final reclamation was 596.32 pounds per acre. Herbaceous production was estimated to be 286.17 pounds, whereas the woody plants species were 310.15 pounds per acre (Table 2).

DISCUSSION

Although the Reference Area productivity estimates were significantly higher than the proposed disturbed areas, the Reference Area continues to be an appropriate standard for revegetation success for reasons described in the aforementioned report, "*Vegetation Sampling in the Wildhorse Ridge Area: 1996*".

TABLE 1: Dry weight annual production in 1999 for the vegetation of the proposed disturbed conveyor system and portal areas in the Wildhorse Ridge vicinity.

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	125.31	225.70	20(100)
Woody Spp.	122.37	234.70	20(100)
TOTAL PRODUCTION	247.68	287.31	20(100)

* Sample size shows the number of sample locations. The number of estimates recorded including "double sampling" is shown in parentheses.

TABLE 2: Dry weight annual production in 1999 for the Reference Area in Wildhorse Ridge vicinity.

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	286.17	182.92	20(100)
Woody Spp.	310.15	463.58	20(100)
TOTAL PRODUCTION	596.32	407.78	20(100)

* Sample size shows the number of sample locations. The number of estimates recorded including "double sampling" is shown in parentheses.

APPENDIX 3-G

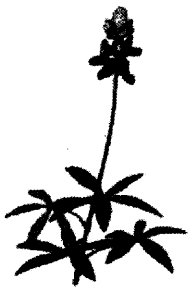
VEGETATION SAMPLING IN THE

WILD HORSE RIDGE TANK SEAM AREA

VEGETATION OF THE TANK SEAM PAD AREA AT WILDHORSE RIDGE

2001

A Comparison Between
The Proposed Disturbed Pad Area
&
Reference Area



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Report: Patrick Collins, Ph.D.

Report Date: January 2002
Fieldwork Date: July-August 2001

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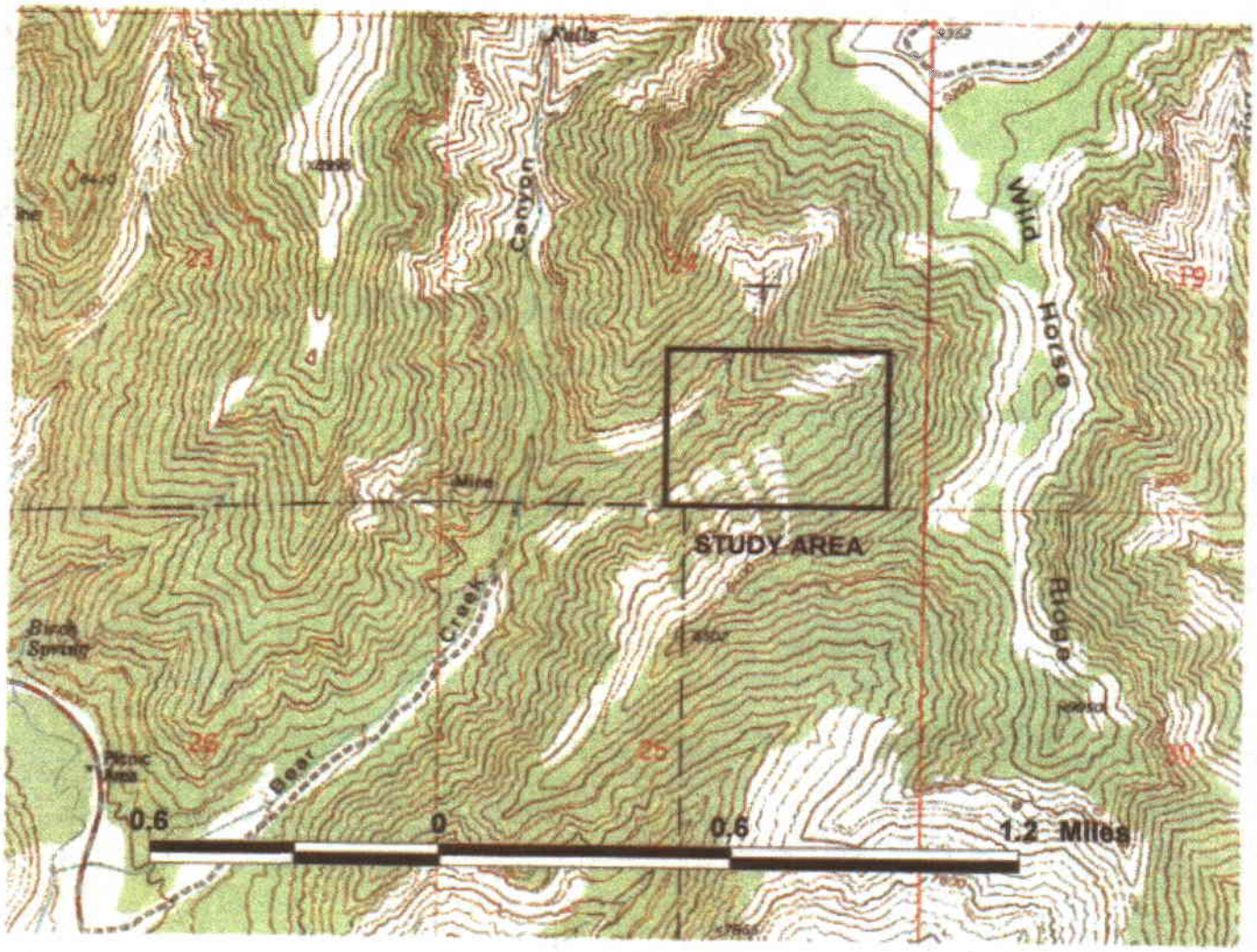
WILDHORSE RIDGE STUDY AREA



TANK SEAM PAD
VEGETATION STUDY AREA
FOR THE CO-OP MINING COMPANY

MT. NEBO SCIENTIFIC, INC.
Springville, Utah

N

VEGETATION OF THE
TANK SEAM PAD AREA
AT WILDHORSE RIDGE

2001

INTRODUCTION

Expanded coal mining activities have been planned for the near future in the Wildhorse Ridge area by the CO-OP Mining Company. In doing so, construction of a pad area has been proposed to facilitate operations for the coal mine. Disturbance of native plant communities would be necessary to construct this "Tank Seam Pad" proposed in the Wildhorse Ridge area. The purpose of this report is to provide quantitative and qualitative vegetation data of the plant communities that will be disturbed as a result of construction of the Tank Seam Pad. Additionally, a Reference Area, or an area with similar plant communities near the proposed disturbed site that will remain undisturbed for the life of the mine, was chosen to represent a standard for revegetation success at the time of final reclamation. The Reference Area was sampled so that this data set could be compared to that of the proposed disturbed area to insure that it is an appropriate representation of it. The Reference Area was chosen to comply with guidelines provided by the State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (DOGM). It was estimated to have similar slopes, soils, species composition, precipitation, elevation and other environmental variables.

Elevation of the proposed disturbed area was approximately 7,900 ft above sea level. The Reference Area was slightly higher at approximately 8,000 ft. The study area was located in Bear Canyon, a branch of Huntington Canyon in Emery County, Utah. The plant communities of the area were primarily mountain brush and coniferous forests.

METHODS

The State of Utah, Division of Oil, Gas and Mining (DOGM) provided guidelines for some of the sample methodologies used in this report. Quantitative and qualitative data were taken on the vegetation of the proposed disturbed and Reference Area at Wildhorse Ridge. Sampling was conducted in late July and early August 2001.

Transect and Quadrat Placement

Random/regular placement of sample quadrats were designed as an attempt to provide unbiased accuracy of the data compiled. This was accomplished by establishing several randomly-placed transect lines through the proposed disturbed area and Reference Area. At regular intervals along the transect lines, random numbers were generated and used to measure distances at right angles from the line to determine sample locations. Whether these random numbers were odd or even determined which side of the transect line a given quadrat was placed. The random number selected would be high enough to place quadrats to the lateral limits of the study areas and all areas in-between. This insured that the sample quadrats were placed randomly over the entire

study area in an attempt to adequately represent the site as a whole.

Cover, Composition & Frequency

Cover estimates were made using ocular methods with meter square quadrats. Species lifeform composition of the understory was also assessed from the quadrat data. Frequency was calculated for each plant species and represents the relative number of times that a given species occurred in the square meter quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows "A Utah Flora" (Welsh et al. 1993).

Woody Species Density

Density of woody plant species were recorded using the point-quarter distance method as described by Cottom and Curtis. In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Sample Adequacy & Statistical Comparisons

Sampling adequacy was calculated using the following formula.

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

where,

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

Student's t-tests were employed to compare the proposed disturbed area with the Reference Area for cover, and density. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to scrutinize the data or to apply further statistical tests if desired.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been included with this report.

Raw Data

The raw data have been summarized on spreadsheets and have also been included in the Appendix.

RESULTS

Proposed Disturbed Tank Seam Pad

Overstory and understory cover both played major roles in the total living cover value of the proposed disturbed area. The total living cover of the area was 62.00%, 25.38% of which was overstory and 36.63% was understory cover (Table 1). Litter was also a major component of the ground cover, representing 37.43%. Of the understory cover, grasses were the dominant lifeform comprising 76.87% of the cover, followed by woody species at 17.13% and forbs at 6.00%.

The most common overstory species was curl-leaf mountain-mahogany (*Cercocarpus ledifolius*). Other important overstory species were: Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), pinyon pine (*Pinus edulis*) and Rocky Mountain juniper (*Juniperus scopulorum*). Of the understory species, Salina wildrye (*Elymus salinus*) and bluebunch wheatgrass (*Elymus spicatus*) were the most common with respect to cover and frequency by quite a wide margin. Several forbs were also represented in the sample quadrats, but each had a cover of less than one percent. For a list of all species present in the quadrats showing all cover and frequency values, refer to Table 2.

Woody species densities of the proposed disturbed area were also recorded. The total number of individuals per acre was estimated at 1,117 individuals per acre. The most important species

according to their densities were curl-leaf mountain-mahogany, white fir, and Douglas fir (Table 3).

Reference Area

The total living cover of the Reference Area at Wildhorse Ridge was 61.63% (Table 4). Of the total living cover, 46.75% of it was represented by understory and 14.88% was overstory cover (Table 4). Like the proposed disturbed area described above, grasses were the most commonly represented lifeform of the understory composition with a relative proportion of 59.67% (Table 4).

The overstory cover was represented by Douglas fir, white fir, curl-leaf mountain-mahogany and pinyon pine. As reported for the proposed disturbed area, the most common understory species were Salina wildrye and bluebunch wheatgrass. There were more forb species present in the Reference Area when compared to the proposed disturbed area. Cover and frequencies by species are shown on Table 5.

Woody species densities are shown on Table 6. Total density was estimated at 1,262 individuals per acre. Diversity of woody species was high in the Reference Area. The most important species were Douglas fir, white fir, and low rabbitbrush (*Chrysothamnus viscidiflorus*).

The Reference Area was marked in the field by flagging and will later be permanently marked.

DISCUSSION

Statistical Comparisons

Student's t-tests were employed to compare parameters of the proposed disturbed Tank Seam Pad area with the Reference Area. These tests confirmed that the Reference Area may be an appropriate standard to be used for future revegetation standards. When the total living covers of the two areas were compared, the statistical analysis suggested no significant difference between the proposed disturbed and Reference Area (Table 7). Woody species density comparisons also suggested no significant difference between the two communities.

CONCLUSIONS

The primary goal for this study was to adequately describe, by quantitative and qualitative data, those areas that are proposed for disturbance by construction of the Tank Seam Pad in the Wildhorse Ridge area. Additionally, it was our objective to locate and sample an area similar to those areas proposed for disturbance that could remain undisturbed until the time of final reclamation by the mining company. This area was called a Reference Area and proved to be similar enough to the proposed disturbed area to be used as such a standard. Statistical analyses suggested the total living cover and woody species densities of the two communities were nearly identical. Moreover, comparisons of the species present and their composition also suggest that the communities were quite similar.

TABLE 1: Total cover and composition summary for the Proposed Disturbed Tank Seam Pad in the Wildhorse Ridge area (2001).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Overstory Cover (O)	25.38	22.62	40
Understory Cover (U)	36.63	12.11	40
Litter	37.43	18.62	40
Bareground	8.60	10.29	40
Rock	17.35	15.04	40
Total Living Cover (O+U)	62.00	24.64	40
UNDERSTORY COMPOSITION			
Trees/Shrubs	17.13	28.02	40
Forbs	6.00	10.89	40
Grasses	76.87	30.04	40

TABLE 2: Species cover and frequency summary for the Proposed Disturbed Tank Seam Pad Area at Wildhorse Ridge (2001).

SPECIES	% MEAN COVER	STANDARD DEVIATIONS	SAMPLE SIZE	RELATIVE FREQUENCY
OVERSTORY				
Abies concolor	5.13	17.23	40	10.00
Amalanchier utahensis	0.50	3.12	40	2.50
Cercocarpus ledifolius	10.63	15.98	40	40.00
Juniperus scopulorum	2.00	10.36	40	5.00
Pinus edulis	2.88	9.87	40	10.00
Pseudotsuga menziesii	4.25	13.02	40	10.00
UNDERSTORY TREES & SHRUBS				
Abies concolor	2.38	7.90	40	12.50
Amalanchier utahensis	0.68	3.91	40	5.00
Chrysothamnus viscidiflorus	0.58	1.91	40	10.00
Juniperus scopulorum	0.25	1.56	40	2.50
Pinus edulis	0.25	1.56	40	2.50
Pseudotsuga menziesii	2.00	7.40	40	12.50
FORBS				
Antennaria parvifolia	0.30	1.12	40	7.50
Castilleja linarifolia	0.45	1.38	40	10.00
Machaeranthera canescens	0.13	0.78	40	2.50
Penstemon sp.	0.55	1.67	40	10.00
Senecio sp.	0.20	0.90	40	5.00
Stanleya pinnata	0.25	1.56	40	2.50
GRASSES				
Elymus salinus	16.13	17.30	40	57.50
Elymus spicatus	12.25	17.03	40	42.50
Poa secunda	0.25	1.09	40	5.00

TABLE 3: Woody species densities of the Proposed Disturbed Tank Seam Pad Area at Wildhorse Ridge (2001).

		NUMBER/ACRE		
Abies concolor		202.54		
Acer glabra		6.98		
Amalanchier utahensis		48.89		
Artemisia tridentata		41.91		
Cercocarpus ledifolius		279.37		
Chrysothamnus viscidiflorus		139.68		
Juniperus scopulorum		76.83		
Opuntia polyacantha		6.98		
Pinus edulis		83.81		
Pinus flexilis		6.98		
Pseudotsuga menziesii		146.67		
Sambucus caerulea		76.83		
TOTAL	$\bar{x}$ =	1117.48	s =	504.46

TABLE 4: Total cover and composition summary for the Mountain Brush/Conifer Reference Area at Wildhorse Ridge (2001).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Overstory Cover (O)	14.88	22.98	40
Understory Cover (U)	46.75	14.69	40
Litter	23.63	17.50	40
Bareground	11.23	7.80	40
Rock	18.40	12.52	40
Total Living Cover (O+U)	61.63	20.14	40
UNDERSTORY COMPOSITION			
Trees/Shrubs	26.87	33.40	40
Forbs	13.46	15.19	40
Grasses	59.67	31.29	40

TABLE 5: Species cover and frequency summary for the Mountain Brush/Conifer Reference Area at Wildhorse Ridge (2001).

SPECIES	% MEAN COVER	STANDARD DEVIATIONS	SAMPLE SIZE	RELATIVE FREQUENCY
OVERSTORY				
Abies concolor	3.38	13.67	40	7.50
Cercocarpus ledifolius	3.13	10.10	40	10.00
Pinus edulis	0.63	3.90	40	5.00
Pseudotsuga menziesii	7.75	19.07	40	22.50
UNDERSTORY TREES & SHRUBS				
Abies concolor	3.38	12.27	40	12.50
Amalanchier utahensis	0.13	0.78	40	2.50
Artemisia tridentata	0.80	4.03	40	5.00
Chrysothamnus viscidiflorus	0.68	2.13	40	10.00
Gutierrezia sarothrae	0.85	2.23	40	15.00
Juniperus scopulorum	0.40	1.74	40	5.00
Pinus edulis	0.88	4.17	40	5.00
Pseudotsuga menziesii	5.25	13.87	40	17.50
FORBS				
Allium cernuum	0.13	0.78	40	2.50
Antennaria parvifolia	0.33	1.17	40	7.50
Artemisia ludoviciana	0.95	3.35	40	12.50
Calochortus nuttallii	0.13	0.78	40	2.50
Castilleja linarifolia	0.18	0.83	40	5.00
Galium bifolium	0.13	0.78	40	2.50
Machaeranthera canescens	1.13	2.09	40	22.50
Machaeranthera grindelioides	0.03	0.16	40	2.50
Penstemon sp.	1.60	3.40	40	20.00
Senecio sp.	1.20	3.45	40	17.50
GRASSES				
Elymus salinus	16.50	19.40	40	52.50
Elymus spicatus	11.50	13.70	40	52.50
Poa secunda	0.63	2.00	40	10.00

TABLE 6: Woody species densities of the Mountain Brush/Conifer Reference Area at Wildhorse Ridge (2001).

	NUMBER/ACRE
Abies concolor	205.01
Amalanchier utahensis	63.08
Artemisia tridentata	78.85
Cercocarpus ledifolius	102.51
Chrysothamnus viscidiflorus	173.47
Eriogonum corymbosum	86.74
Gutierrezia sarothrae	134.05
Juniperus scopulorum	70.97
Pinus edulis	55.20
Pinus flexilis	7.89
Pseudotsuga menziesii	252.32
Sambucus caerulea	31.54
TOTAL	$\bar{x}$ = 1261.62
	s = 725.88

TABLE 7: Statistical summary sheet for the proposed disturbed area and Reference Areas at Wildhorse Ridge (2001).

PROPOSED DISTURBED AREAS				
Total Living Cover*	x=62.00	s=24.64	n=40	nMIN=25.88
Density	x=1117.48	s=504.46	n=40	nMIN=33.39
REFERENCE AREA				
Total Living Cover*	x=61.63	s=20.14	n=40	nMIN=17.50
Density	x=1261.62	s=725.88	n=40	nMIN=54.24
STATISTICAL ANALYSES				
Living Cover	t=0.074	df=78	SL=N.S.	
Density	t=-1.031	df=78	SL=N.S.	

x = sample mean, s = sample standard deviation,
n = sample size, nMIN = minimum adequate sample,
NS = nonsignificant, t = Student's t-value, p=probability level
df = degrees of freedom, SL = significance level,
nMIN = Minium adequate sample necessary at the 80% level (±.10).
* represents understory and overstory cover combined.

COLOR PHOTOGRAPHS
OF THE WILDHORSE RIDGE AREA

Proposed Disturbed Tank Seam Pad

Reference Area

APPENDIX

Raw Data

CO-OP Mining
Wild Horse Ridge Tank Seam Pad
Proposed Disturbed
Mountain Brush/ Conifer
Exposure: West
Slope: 24 deg.
Sample Date: 31 July 01

	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Abies concolor	0.00	0.00	0.00	20.00	70.00	0.00	0.00
Amalanchier utahensis	0.00	0.00	0.00	20.00	0.00	0.00	0.00
Cercocarpus ledifolius	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNDERSTORY							
SHRUBS							
Abies concolor	0.00	0.00	0.00	40.00	0.00	0.00	0.00
Amalanchier utahensis	0.00	0.00	0.00	0.00	25.00	0.00	0.00
Chrysothamnus viscidiflorus	5.00	10.00	0.00	0.00	0.00	0.00	3.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS							
Antennaria parvifolia	0.00	0.00	5.00	0.00	0.00	0.00	2.00
Castilleja linarifolia	3.00	5.00	5.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon sp.	7.00	5.00	0.00	0.00	5.00	0.00	0.00
Senecio sp.	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Stanleya pinnata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES							
Elymus salinus	25.00	5.00	0.00	0.00	0.00	40.00	20.00
Elymus spicatus	0.00	0.00	20.00	0.00	15.00	0.00	0.00
Poa secunda	0.00	0.00	0.00	0.00	0.00	0.00	5.00
COVER							
Overstory	0.00	0.00	0.00	40.00	70.00	0.00	0.00
Understory	40.00	25.00	30.00	40.00	45.00	45.00	30.00
Litter	45.00	10.00	5.00	10.00	50.00	20.00	10.00
Bareground	5.00	40.00	30.00	5.00	4.00	5.00	10.00
Rock	10.00	25.00	35.00	45.00	1.00	30.00	50.00
% COMPOSITION							
Shrubs	12.50	40.00	0.00	100.00	55.56	0.00	10.00
Forbs	25.00	40.00	33.33	0.00	11.11	11.11	6.67
Grasses	62.50	20.00	66.67	0.00	33.33	88.89	83.33
Overstory + Understory	40.00	25.00	30.00	80.00	115.00	45.00	30.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	40.00	0.00	0.00	50.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00
0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	10.00	0.00	0.00	45.00	10.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	25.00	0.00	30.00	0.00	0.00	0.00	30.00	0.00	45.00
0.00	20.00	20.00	0.00	20.00	35.00	15.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	5.00	20.00	40.00	0.00	0.00	50.00	0.00	35.00	55.00
20.00	45.00	35.00	40.00	25.00	40.00	60.00	50.00	30.00	45.00
70.00	30.00	40.00	40.00	10.00	10.00	40.00	35.00	60.00	45.00
5.00	5.00	5.00	10.00	35.00	20.00	0.00	5.00	5.00	5.00
5.00	20.00	20.00	10.00	30.00	30.00	0.00	10.00	5.00	5.00
50.00	0.00	14.29	25.00	0.00	5.00	75.00	40.00	100.00	0.00
25.00	0.00	14.29	0.00	20.00	7.50	0.00	0.00	0.00	0.00
25.00	100.00	71.43	75.00	80.00	87.50	25.00	60.00	0.00	100.00
55.00	50.00	55.00	80.00	25.00	40.00	110.00	50.00	65.00	100.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	20.00	15.00	15.00	0.00	0.00	0.00	0.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	65.00	0.00	15.00	0.00
10.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00
0.00	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	35.00	0.00	40.00	0.00	0.00	35.00
10.00	35.00	40.00	45.00	0.00	35.00	0.00	50.00	25.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	15.00	50.00	15.00	15.00	50.00	65.00	0.00	15.00	15.00
20.00	35.00	40.00	50.00	35.00	35.00	40.00	55.00	25.00	45.00
10.00	55.00	50.00	10.00	50.00	60.00	58.00	35.00	45.00	40.00
10.00	1.00	5.00	5.00	5.00	4.00	1.00	5.00	5.00	5.00
60.00	9.00	5.00	35.00	10.00	1.00	1.00	5.00	25.00	10.00
50.00	0.00	0.00	10.00	0.00	0.00	0.00	9.09	0.00	22.22
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	100.00	100.00	90.00	100.00	100.00	100.00	90.91	100.00	77.78
30.00	50.00	90.00	65.00	50.00	85.00	105.00	55.00	40.00	60.00

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	25.00	20.00	30.00	30.00	0.00	35.00	0.00	50.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
40.00	40.00	0.00	35.00	15.00	0.00	15.00	45.00	25.00	45.00
0.00	0.00	65.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	25.00	20.00	30.00	30.00	50.00	35.00	0.00	50.00
40.00	40.00	65.00	35.00	40.00	30.00	15.00	45.00	25.00	45.00
10.00	40.00	34.00	45.00	40.00	15.00	70.00	50.00	40.00	45.00
35.00	5.00	0.00	1.00	2.00	30.00	5.00	1.00	5.00	5.00
15.00	15.00	1.00	19.00	18.00	25.00	10.00	4.00	30.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	12.50	33.33	0.00	0.00	0.00	0.00
100.00	100.00	100.00	100.00	87.50	66.67	100.00	100.00	100.00	100.00
40.00	50.00	90.00	55.00	70.00	60.00	65.00	80.00	25.00	95.00

CO-OP Mining
Wild Horse Ridge Tank Seam Pad
Proposed Disturbed
Mountain Brush/ Conifer
Exposure: West
Slope: 24 deg.
Sample Date: 31 July 01

38.00	39.00	40.00	Mean	SDev	Freq	
						OVERSTORY
0.00	0.00	80.00	5.13	17.23	10.00	*Abies concolor*
0.00	0.00	0.00	0.50	3.12	2.50	*Amalanchier utahensis*
50.00	35.00	0.00	10.63	15.98	40.00	*Cercocarpus ledifolius*
0.00	0.00	0.00	2.00	10.36	5.00	*Juniperus scopulorum*
0.00	0.00	0.00	2.88	9.87	10.00	*Pinus edulis*
0.00	0.00	0.00	4.25	13.02	10.00	*Pseudotsuga menziesii*
						UNDERSTORY
						SHRUBS
0.00	0.00	0.00	2.38	7.90	12.50	*Abies concolor*
0.00	0.00	0.00	0.68	3.91	5.00	*Amalanchier utahensis*
0.00	0.00	0.00	0.58	1.91	10.00	*Chrysothamnus viscidiflorus*
0.00	0.00	0.00	0.25	1.56	2.50	Juniperus scopulorum
0.00	0.00	0.00	0.25	1.56	2.50	*Pinus edulis*
0.00	0.00	10.00	2.00	7.40	12.50	Pseudotsuga menziesii
						FORBS
0.00	0.00	0.00	0.30	1.12	7.50	*Antennaria parvifolia*
0.00	0.00	0.00	0.45	1.38	10.00	*Castilleja linarifolia*
0.00	0.00	0.00	0.13	0.78	2.50	*Machaeranthera canescens*
0.00	0.00	0.00	0.55	1.67	10.00	*Penstemon sp.*
0.00	0.00	0.00	0.20	0.90	5.00	*Senecio sp.*
0.00	0.00	0.00	0.25	1.56	2.50	*Stanleya pinnata*
						GRASSES
5.00	40.00	5.00	16.13	17.30	57.50	*Elymus salinus*
0.00	0.00	0.00	12.25	17.03	42.50	*Elymus spicatus*
0.00	0.00	0.00	0.25	1.09	5.00	*Poa secunda*
						COVER
50.00	35.00	80.00	25.38	22.62		Overstory
5.00	40.00	15.00	36.63	12.11		Understory
45.00	60.00	60.00	37.43	18.62		Litter
5.00	0.00	10.00	8.60	10.29		Bareground
45.00	0.00	15.00	17.35	15.04		Rock
						% COMPOSITION
0.00	0.00	66.67	17.13	28.02		Shrubs
0.00	0.00	0.00	6.00	10.89		Forbs
100.00	100.00	33.33	76.87	30.04		Grasses
55.00	75.00	95.00	62.00	24.64		Overstory + Understory

CO-OP Mining
Wild Horse Ridge Tank Seam Pad
Reference Area
Exposure: West
Slope: 34 deg.

Sample Date: 6 Aug 01	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Abies concolor	0.00	0.00	0.00	0.00	0.00	60.00	65.00
Cercocarpus ledifolius	0.00	45.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	15.00	0.00	0.00
UNDERSTORY							
SHRUBS							
Abies concolor	0.00	0.00	0.00	0.00	0.00	35.00	5.00
Amalanchier utahensis	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus viscidiflorus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	10.00	0.00	0.00
FORBS							
Allium cernuum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Antennaria parvifolia	3.00	0.00	5.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calochortus nuttallii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Castilleja linarifolia	2.00	0.00	0.00	0.00	5.00	0.00	0.00
Galium bifolium	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera grindelioides	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon sp.	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Senecio sp.	0.00	0.00	0.00	5.00	0.00	0.00	0.00
GRASSES							
Elymus salinus	0.00	45.00	20.00	20.00	20.00	0.00	0.00
Elymus spicatus	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Poa secunda	5.00	0.00	5.00	0.00	0.00	0.00	0.00
COVER							
Overstory	25.00	45.00	0.00	0.00	15.00	60.00	65.00
Understory	45.00	50.00	35.00	30.00	40.00	35.00	5.00
Litter	35.00	30.00	10.00	10.00	40.00	60.00	90.00
Bareground	5.00	5.00	15.00	35.00	10.00	3.00	3.00
Rock	15.00	15.00	40.00	25.00	10.00	2.00	2.00
% COMPOSITION							
Shrubs	22.22	0.00	0.00	16.67	25.00	100.00	100.00
Forbs	11.11	10.00	28.57	16.67	25.00	0.00	0.00
Grasses	66.67	90.00	71.43	66.67	50.00	0.00	0.00
Overstory + Understory	70.00	95.00	35.00	30.00	55.00	95.00	70.00

CO-OP Mining
Wild Horse Ridge Tank Seam Pad
Reference Area
Exposure: West
Slope: 34 deg.
Sample Date: 6 Aug 01

	1.00	2.00	3.00	4.00	5.00	6.00	7.00
OVERSTORY							
Abies concolor	0.00	0.00	0.00	0.00	0.00	60.00	65.00
Cercocarpus ledifolius	0.00	45.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	15.00	0.00	0.00
UNDERSTORY							
SHRUBS							
Abies concolor	0.00	0.00	0.00	0.00	0.00	35.00	5.00
Amalanchier utahensis	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Artemisia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysothamnus viscidiflorus	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juniperus scopulorum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pinus edulis	10.00	0.00	0.00	0.00	0.00	0.00	0.00
Pseudotsuga menziesii	0.00	0.00	0.00	0.00	10.00	0.00	0.00
FORBS							
Allium cernuum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Antennaria parvifolia	3.00	0.00	5.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calochortus nuttalii	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Castilleja linarifolia	2.00	0.00	0.00	0.00	5.00	0.00	0.00
Galium bifolium	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon sp.	0.00	0.00	5.00	0.00	0.00	0.00	0.00
Senecio sp.	0.00	0.00	0.00	5.00	0.00	0.00	0.00
GRASSES							
Elymus salinus	0.00	45.00	20.00	20.00	20.00	0.00	0.00
Elymus spicatus	25.00	0.00	0.00	0.00	0.00	0.00	0.00
Poa secunda	5.00	0.00	5.00	0.00	0.00	0.00	0.00
COVER							
Overstory	25.00	45.00	0.00	0.00	15.00	60.00	65.00
Understory	45.00	50.00	35.00	30.00	40.00	35.00	5.00
Litter	35.00	30.00	10.00	10.00	40.00	60.00	90.00
Bareground	5.00	5.00	15.00	35.00	10.00	3.00	3.00
Rock	15.00	15.00	40.00	25.00	10.00	2.00	2.00
% COMPOSITION							
Shrubs	22.22	0.00	0.00	16.67	25.00	100.00	100.00
Forbs	11.11	10.00	28.57	16.67	25.00	0.00	0.00
Grasses	66.67	90.00	71.43	66.67	50.00	0.00	0.00
Overstory + Understory	70.00	95.00	35.00	30.00	55.00	95.00	70.00

8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	70.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00
0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	2.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	3.00	5.00	0.00	0.00	0.00
25.00	25.00	0.00	0.00	35.00	25.00	15.00	0.00	20.00	60.00
0.00	0.00	25.00	15.00	0.00	0.00	5.00	40.00	30.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
40.00	35.00	50.00	85.00	45.00	40.00	35.00	55.00	70.00	65.00
10.00	15.00	10.00	5.00	10.00	10.00	10.00	15.00	15.00	20.00
5.00	15.00	20.00	5.00	20.00	10.00	25.00	15.00	10.00	15.00
45.00	35.00	20.00	5.00	25.00	40.00	30.00	15.00	5.00	0.00
0.00	14.29	50.00	82.35	22.22	30.00	0.00	0.00	28.57	0.00
12.50	14.29	0.00	0.00	0.00	7.50	42.86	27.27	0.00	7.69
87.50	71.43	50.00	17.65	77.78	62.50	57.14	72.73	71.43	92.31
40.00	35.00	50.00	85.00	45.00	50.00	35.00	55.00	70.00	65.00

18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	7.00	10.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	20.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	20.00	0.00
30.00	0.00	55.00	70.00	25.00	30.00	0.00	0.00	0.00	10.00
25.00	15.00	0.00	0.00	15.00	15.00	30.00	10.00	20.00	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00
55.00	50.00	65.00	70.00	50.00	55.00	65.00	65.00	45.00	55.00
10.00	20.00	10.00	15.00	10.00	15.00	10.00	20.00	10.00	20.00
10.00	10.00	10.00	5.00	20.00	15.00	10.00	5.00	20.00	10.00
25.00	20.00	15.00	10.00	20.00	15.00	15.00	10.00	25.00	15.00
0.00	30.00	15.38	0.00	10.00	0.00	38.46	84.62	0.00	18.18
0.00	40.00	0.00	0.00	10.00	18.18	15.38	0.00	55.56	18.18
100.00	30.00	84.62	100.00	80.00	81.82	46.15	15.38	44.44	63.64
55.00	50.00	65.00	70.00	50.00	55.00	65.00	80.00	45.00	55.00

28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	0.00	0.00	10.00	75.00	0.00	75.00	35.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	15.00	0.00	0.00	35.00	20.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	4.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	40.00	10.00	0.00	35.00	0.00	0.00	45.00
10.00	10.00	25.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	0.00	0.00	10.00	75.00	0.00	75.00	35.00	15.00	40.00
35.00	30.00	35.00	40.00	25.00	50.00	35.00	35.00	45.00	45.00
35.00	10.00	30.00	20.00	25.00	20.00	20.00	55.00	40.00	50.00
5.00	30.00	25.00	5.00	5.00	10.00	10.00	5.00	5.00	4.00
25.00	30.00	10.00	35.00	45.00	20.00	35.00	5.00	10.00	1.00
42.86	0.00	0.00	0.00	60.00	14.00	0.00	100.00	77.78	0.00
28.57	50.00	28.57	0.00	0.00	26.00	0.00	0.00	22.22	0.00
28.57	50.00	71.43	100.00	40.00	60.00	100.00	0.00	0.00	100.00
95.00	30.00	35.00	50.00	100.00	50.00	110.00	70.00	60.00	85.00

CO-OP Mining
Wild Horse Ridge Tank Seam Pad
Reference Area
Exposure: West
Slope: 34 deg.
Sample Date: 6 Aug 01

38.00	39.00	40.00	Mean	SDev	Freq	
						OVERSTORY
0.00	0.00	0.00	3.38	13.67	7.50	*Abies concolor*
25.00	15.00	0.00	3.13	10.10	10.00	*Cercocarpus ledifolius*
0.00	0.00	0.00	0.63	3.90	5.00	*Pinus edulis*
0.00	0.00	10.00	7.75	19.07	22.50	*Pseudotsuga menziesii*
						UNDERSTORY
						SHRUBS
0.00	0.00	0.00	3.38	12.27	12.50	*Abies concolor*
0.00	0.00	0.00	0.13	0.78	2.50	*Amalanchier utahensis*
0.00	0.00	0.00	0.80	4.03	5.00	*Artemisia tridentata*
0.00	0.00	0.00	0.68	2.13	10.00	*Chrysothamnus viscidiflorus*
0.00	0.00	0.00	0.85	2.23	15.00	*Gutierrezia sarothrae*
0.00	0.00	0.00	0.40	1.74	5.00	*Juniperus scopulorum*
0.00	0.00	0.00	0.88	4.17	5.00	*Pinus edulis*
0.00	0.00	60.00	5.25	13.87	17.50	*Pseudotsuga menziesii*
						FORBS
0.00	0.00	0.00	0.13	0.78	2.50	*Allium cernuum*
0.00	0.00	0.00	0.33	1.17	7.50	*Antennaria parvifolia*
0.00	0.00	0.00	0.95	3.35	12.50	*Artemisia ludoviciana*
0.00	0.00	0.00	0.13	0.78	2.50	*Calochortus nuttallii*
0.00	0.00	0.00	0.18	0.83	5.00	*Castilleja linarifolia*
0.00	0.00	0.00	0.13	0.78	2.50	*Galium bifolium*
0.00	0.00	0.00	1.13	2.09	22.50	*Machaeranthera grindelioides*
0.00	0.00	0.00	0.03	0.16	2.50	*Machaeranthera canescens*
0.00	10.00	0.00	1.60	3.40	20.00	*Penstemon sp.*
0.00	0.00	0.00	1.20	3.45	17.50	*Senecio sp.*
						GRASSES
0.00	0.00	0.00	16.50	19.40	52.50	*Elymus salinus*
50.00	35.00	5.00	11.50	13.70	52.50	*Elymus spicatus*
0.00	0.00	0.00	0.63	2.00	10.00	*Poa secunda*
						COVER
25.00	15.00	10.00	14.88	22.98		Overstory
50.00	45.00	65.00	46.75	14.69		Understory
45.00	40.00	20.00	23.63	17.50		Litter
4.00	5.00	5.00	11.23	7.80		Bareground
1.00	10.00	10.00	18.40	12.52		Rock
						% COMPOSITION
0.00	0.00	92.31	26.87	33.40		Shrubs
0.00	22.22	0.00	13.46	15.19		Forbs
100.00	77.78	7.69	59.67	31.29		Grasses
75.00	60.00	75.00	61.63	20.14		Overstory + Understory

Appendix 3H

Mohrland Vegetation Study

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Appendix 3-I

Fish and Wildlife Resource Information

UMC 783.20; Fish and Wildlife Resource Information Co-Op Mine Company Mining Projects

General Wildlife Resource Information-All Species of Vertebrate Wildlife

The main plan area encompasses a portion of the Wasatch Plateau in Emery County, Utah. This area drains into the Huntington Creek and into the San Rafael River, which flows into the Green River and ultimately into the Colorado River at a pint upstream form Lake Powell. Generally speaking, the Wasatch Plateau is encompassed by cold desert (Canadian, Hudsonian and Alpine life zones), submontane (Transition life zone) and mountain (Canadian, Hudsonian and Alpine life zones ecological associations. These life zones could be inhabited on occasion and during different seasons of the yr 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 percent of these are of high interest to the State of Utah.

The division Publication No. 78-16 "Species List of Vertebrate Wildlife that Inhabit Southeastern Utah" 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 fames 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[3]). Critical wildlife use areas followed in respective importance by high-priority, substantial value and limited value wildlife use areas requite various levels of protection form man's activities and developments. Wildlife habitats and use areas area tanked as being of critical or high-priority value to wildlife should be protected form 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 existence 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.

[3] Tables referenced in this Appendix can be found in Appendix 3-K

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 a 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 decrease 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 Resources as Class 4 are classified as being of substantial 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, pinion-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 wild lands will be development of habitats so that the post-mining 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

There are maps available for you to copy at our Southeastern Regional Office in Price, Utah, that display high value use areas for high interest fish species. Also displayed are known seeps, springs, wetlands, and riparian zones. All vertebrates species of high Interest wildlife and their distributions are discussed in the following narrative.

Water

Due to demands of state and general 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 nor generally available.

Macroinvertebrates

The result form studies of macroinvertibrates may be required for purposes of determining need for stream buffer zones (UCM 817.57) in stream sections supporting biological communities. Since historic impacts form this mine's operation have impacted Huntington Creek and Trail Creek data relative to macroinvertebrates as a pollution index or a forage base for fishes or other predators dependant upon the aquatic resource need 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 form entering Trail Creek and Huntington Creek. Snow removal is a significant contribution of sediments to local riverain systems. Deposition of coal particles in the aquatic system could have a variety of negative impacts on invertebrate and fish population.

The result form long-term studies of macroinvertebrates in Huntington Creek and Trail Creel would be of value for the Company to demonstrate when impacts that resulted form accumulations of coal and other sediments in each creek have ceased. Other sediments have resulted form encroachment of the road upon Trail Creek. These accumulations of sediments will likely continue until coal particles cease to enter either creek and the encroachment problems elevated.

Studies relative to macroinvertebrates if desired or needed, must be conducted by a qualified, private consultant.

Fish—Species Occurrence and Use Areas

Aquatic habitats associated with the mine plan area support three species of game and two species of no game fish; all of which are protected. Of these fish, four species have been determined to be of high interest to Utah (Appendix A and reference Division Publication NO. 78-16[4]).

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 form 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 manages 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.

[4] See Appendix 3-K

The brown trout is an exotic species. It's 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 planting 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 min 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.

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 population; pawning 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 eh nest. They are known to spawn in water temperatures ranging form 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 not fish in Trail Creek, its flow of water is of great value for reproductive success of spawning trout in the lower reaches of Huntington Creek for which is it tributary water. Additionally, drift of macroinvertebrates form this stream represent an important contribution of forage to trout and other fishes in Huntington Creek.

If project operations are planned of develop that would later, destroy or discharge polluting effluents into any perennial waters, appropriate state and federal permits, a mitigation plan and results form high level studies of the salmons fishery resource, if any, would be required of the Company. Achievement of mitigation would demand detailed studies of steram 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 778.16.

It is important to note that no species if fish having relative abundance so low as to have caused them to be federally listed as threatened or endangered inhabit the mine plan or adjacent area. The endangered humpback chub, bonytail chub and Colorado squawfish inhabit the Green and Colorado Rivers. Additionally, the humpback (razorback) suckers also inhabit 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.

Terrestrial Use Areas

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 aforementaioned situations are considered to represent unique habitat associations (Table 1).

Riparian and wetland areas area 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. Section 13, 14, 15, 22, 23, 24, 25, and 26 of Township 16 South Range 7 East have been ranked

as being of critical value to wildlife. These rankings were developed through wildlife species 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 inhibit 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 (Appendix A).

The tiger salamander is a yearlong resident animal of the project area. The substantial value use area for the adult form is represented by the 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 form the cold desert (upper Sonoran life zone) through the submontane (Transition life zone) and into the mountain (Canadian life zone) ecological association. The larva form, often referred to as a mud puppy, is a filled animal that must remain in water within the above-described ecological associations. It is interesting to note tat the larva may fail to transform into 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 form March trough June and is sexually mature after one yr. 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 of just at the time they are laid. The eggs, singly or in small clusters, adhere to submerge 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 inhabit the water.

Post-embryonic development of a salamander's larval form progresses at a pace somewhat controlled by water temperatures; in some cold waters larva may not transform into an adult and drying up of a pool may hasten the process.

Migration to or form water usually occurs at night, during or just after a rainstorm. When inhabiting terrestrial sites the tiger salamander is most active at night, particularly on rainy nights, form March through September.

Larva, when small feed on aquatic invertebrates and become predacious to the pint 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 projected area have been determined to be of high interest to the State of Utah (Appendix A).

The Utah mile snake is a yearling resident animal of the project area. It's substantial value use area encompasses all wildlife habitats excluding from the upper Sonoran (cold desert life zone) through submontane (Transition life zone) and into the mountain (Canadian an 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 bird eggs.

The mile snake may live beyond twenty yr 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 mile snakes produce clutches which average seven eggs. The eggs are

secreted in a moist warm environment 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 king snake 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 mountain (Canadian and possibly Hudsonian life zones) ecological association. Little is know 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 milk snake.

The 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 abundance 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 (Appendix A).

Migratory birds protected by Executive Order # 13186 may inhabit the area. Research from the Utah Chapter of Partners in Flight shows that approximately 75% of these birds are dependent upon corridors of trees and shrubs that grow along our streams and rivers. Due to the lack of vegetation along both Bear Creek and the left fork of Fish Creek it is unlikely many of these species would use these areas. In contrast both the right fork of Fish Creek and Cedar Creek are well vegetated and could provide quality habitat for many species.

Ducks commonly known as water flow are not known to utilize the project area, but may on occasion or during different seasons of the year make limited use of the riparian 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 provided 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 exists 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 (prairies, 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 (Appendix A).

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 protection stipulations for aeries are available form the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

The current level of data relative to site specific use of the area by raptors us 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 regularity of golden eagle observation 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 of a disturbance were to originate from above and within direct line of sight to the eagle aerie.

The mine plan and adjacent areas have been ranked as being of subsidence value to golden eagles.

The northern bald eagle is a threatened winter resident (November 15 to March 15) of the local area. Only two currently (1990) known nesting sites are in Utah along the Colorado River.

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 in common) are yearlong residence of the mine plan adjacent areas. Each of these species utilizes cliff nesting sites~~. To date there are no know 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 existing 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 specific 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 form 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 yr progresses, they move to higher elevations.

The males are polygamous and will set up a 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 protein 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 continuum of habitats extending form 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 yr 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 ruffed grouse while being brooded rely heavily in 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 form hatching into mid-August.

The bad-tailed pigeon is a summer resident of the projected 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 area 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 yr. 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 tow 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 critical value to maintenance of this species. Little is know 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 mountain 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 be utilized in successive yr.

The belted kingfisher is a yearlong resident of the project area. It is often found only along riverian systems and its substantial value use area extends form the cold desert through the submontane and into the mountain 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 borrow along stream banks, thus, dirt bank habitats along riparian areas are of critical value to this 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 mountain ecological association represent this bird's substantial valued user area. It is important to note that the pileated woodpecker had 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 is the mountain 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 is a yearlong resident of the environs associated with the project area and it has been 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 not 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 know to inhabit the environs of the biogeogrpahic 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 mountain ecological association. The purple martin feeds on flying insects and may secret it's nest within any suitable above-ground cavity.

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 form the pinion-juniper habitat of the submontane ecological association up into the lower forest habitats within the Canadian life zone of the mountain ecological association. The mountain bluebird utilizes the same continuum 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 spans a broad continuum 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 mountain ecological associations. This bird's nest is built twenty or more ft 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 cotton wood stands and the continuum of habitats extending form the pinion-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 inhibit the biogeographic area in which the project and adjacent areas are located. It is probable that seventy-five of these species inhibit the project area (Reference the Division Publication NO. 78-16). Twenty-six species of the mammals inhibiting the project are have been determined to be of high interest to the State of Utah (Appendix).

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 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 elevated spruce-fir habitats of the submontane and mountain (Canadian life zone) ecological association. Such areas represent this bats substantial valued use area.

The snowshoes 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 value use area is restricted to the spruce-fir and nearby aspen and riparian habitats of the mountain (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 ft in elevation and the desert cottontail inhabits sites lower than 7,000 ft 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 of 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 mountain (Canadian and Hudsonian life zones) ecological association. This specie 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 each yr-February through March and June through July. After which, 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.

Beavers are yearlong inhabitants of the biogeographic area that surround the project site. The substantial valued area is restricted to riparian and adjacent aspen habitats (those located within 100 metes of the riparian zone) in the cold desert, submontane and mountain (Canadian life zone) ecological associations. These animals construct a conical shaped lodge in which a family group lives throughout the yr. The lodge is of critical value to maintenance of the beaver population. One litter of kits is produced each yr; they are born between late April and early July after a gestation period of 128 days. Kits and yearlings coin habit the lodge with the adult pair. When they attain 2 yr of the age they are forced to leave; females can breed at 2.5 yr of age. Due to the animals dependency upon flowing water and the association 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 mountain (Canadian life zone) ecological associations. Almost nothing is known of their populations dynamics. Without doubt a crucial period for this species 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.

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 areas that surround the project site. Their substantial valued use area is represented by all natural wildlife habitats (excluding the pasture and fields and urban or park types) extending form the submontane associations. These animals go into a semi-hibernation during winter. During this crucial period, which may last form December through March, the animal secrets itself in a den is 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 biogeographic area that surround the project site. They are all protected and classified as furbearers-short-tailed and long-tailed weasels, mink, wolverine, marten, badger, striped and

furbearers, are also inhabitants of the biogeographic area that surrounds the project 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 form the cold desert up into the mountain (Canadian and Hudsonian life zones) ecological associations. The short-tailed weasel and mink populations extended their use form the submontane into the mountain ecological association. It is important to note that the weasel is restricted to the Canadian life zone; where as the mink utilize the Canadian life zone; where as the mink utilize the Canadian and Hudsonian life zones.

The substantial valued use area for badger and skunks span all wildlife habitats other than dense forest in the cold desert, submontane and mountain (Canadian life zone) ecological associations. Skunk show some affinity for habitats proximal to water. Skunk and badgers are dependent upon a suitable prey source.

The crucial period for maintenance of all furbearers, raccoons and muskrats 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 use are for bobcats extends form the cold desert through the submontane and into the mountain (Canadian life zone) ecological associations. 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 not that bobcats occasionally do kill the young of the big game animals.

The substantial valued use area for the Canada lynx is restricted to the Canadian and Hudsonian life zones of the mountain 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 form the submontane into the mountain (Canadian and Hudsonian life zones) 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 surround the project site. Their substantial valued use area spans all wildlife habitats extending form the cold desert through the submontane and mountain 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 reinforces the deer's urge to migrate and continued 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; there areas are usually inhabited between November 1 and May 15 each yr. During winters with severe conditions the higher elevation portion of the winter range become 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 form man's disturbance when the deer are physically presented 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 extend of summer range

is the major limiting factor for 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 rages for mule deer on the project site.

Mule deer fawn during the month of June. The continuum of wildlife habitats extend form the pinion-juniper through the shrubland and into the aspen types 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 not 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 area inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats in the mountain 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 yearling basis (see attached map).

Migration of moose form 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 tanked 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 yr. During winters with severe conditions the higher elevation portion of the winter ranges becomes unavailable to moose due to snow depth. Critical valued sites must be protected form 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 form 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 area 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 not 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 form the submontane through the mountain ecological association. Elk do not hoe as strong of conditions, but they migrate to wintering areas (see attached map).

Migration of elk from summer range to winter range is initiated during lat October; probably, the annual disturbance of the fall hunting seasons coupled with the changing weather conditions is the initial stimulus. The onset of winter weather keeps elk on the winter range.

A portion of the project site represent 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 yr. During winters with sever 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 winter ranges for elk. Critical valued sites must be protected form 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 forest with lush under story 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.

Appendix 3-J

Mitigation and Impact Avoidance Procedures.

General to all Wildlife

Mitigation and Impact Avoidance Procedures General to all Wildlife

Utah Division of Wildlife Resources provides the following recommendation in order to minimize disturbances and impacts on wildlife and their habitats that could be impacted during developmental, operational and reclamation operations at the mining project. The recommendations address how enhancement of the wildlife resource and their habitats as discussed in UMC 783.20 can be achieved. They are also consistent with the performance standards of UMC 817.97. In instances where it would be necessary to restore or could be beneficial to enhance or develop high value rates of application are provided as "Appendix B" (UMC 817.97 and UMC 817.111 through 817.117). This list should prove useful in meeting the additional requirements to be imposed upon the operator if the primary or secondary land use will be for wildlife habitats (UMC 817.97 d 9). Additionally, "Appendix C" represents a list of commercial sources for plant materials.

The project and adjacent areas are represented by nine basic wildlife habitats which are inhabited on occasion and during different seasons of the yr by about 239 species of vertebrate wildlife. The wildlife habitats and use areas for the "high interest" species form this group of wildlife have been ranked into four levels of importance. The most valuable to an individual species or ecological assemblage are the critical sites followed in respective importance by high-priority, substantial value and limited value sites. Each type of use area requires various and

specific levels of protection from man's activities. Additionally, due to the variability of vegetation communities in each use area, various and specific technologies in site development will need to be evaluated for possible mitigation, enhancements of wild land habitats or the required level of reclamation. It is recommended that all land clearing impacts be designed so that irregular shaped openings are created in contrast to openings that would have straight edges.

It is recommended that the Company make significant efforts to educate all employees associated with their coal handling operation of the intricate values of the wildlife resource associated with the project and adjacent areas and the local area. Each employee should be advised not to unnecessarily or without proper permit harass or take a wildlife. (Apprehension of wildlife violators has increased by nearly 250 percent during recent yr in the region). It is especially important that wildlife not be harassed during winter periods, breeding seasons and early in the rearing process. Exploration should be limited as much as possible during these crucial periods.

During winter wildlife are always in a depleted condition. Unnecessary disturbance by man causes them to use up critical and limited energy reserves which, often times, results in mortality. In less severe cases, the fetus being carried by mammals may be aborted or absorbed by the animal, thus reducing reproductive success of population.

Early in the rearing process, young animals need the peace and tranquility normally afforded by remote wild lands. It is also during this crucial period that young animals gain the strength and ability to elude man and other predators. This allows the young animal to develop

in relatively unstressed situations and to utilize habitats that are secure from predators. Disturbance by man can compromise this situation and result in abandonment of the young by the female, increased accidents that result in mortality to young animals or increased natural predation. It is recommended that employees be cautioned against disturbing young animals or females with young if accidentally located.

Employees associated with coal handling operations should be instructed that when wildlife is encountered during routine work that they not stop vehicles for viewing purposes. Moving traffic is less disturbing to wildlife than traffic that stops or results in out-of-the-vehicle activities. If viewing is desirable, the vehicle should only be slowed, but not stopped.

Hunting and other state and federal wildlife regulations must be adhered to by sportsmen utilizing the project area.

Mitigation and Impact Avoidance Procedures for Aquatic Wildlife

There are no recommendations for a wildlife plan that would enhance any fishery. If ultimate operations are planned or occur that could physically or chemically impact any perennial stream beyond the impact of mere crossings, detailed reclamation plan will be required. Permanent culvert crossings, detailed reclamation plans will be required. Permanent culvert crossings exceeding a width of eight ft must have a natural bottom and devices for reducing stream velocity so that fish migration is nor blocked. A reclamation pan for stream or lake would have to provide for measurement of the physical characters of the water prior to

disturbance. Such measurements should consider surface water information required in SMC 779.16, data on stream velocity, gradient, width, depth, pool-riffle ratio and substrata types.

Reclamation that would achieve development of a lake bed or stream channel similar in character to that which existed prior to disturbance should result in natural re-establishment of macroinvertibrates, macrophytes and a fish population. If merited, the Division could then introduce desired fishes into those waters. This would adequately mitigate for disturbed and temporary loss of aquatic resources. There would be no mitigation for displacement and possible loss of other wildlife species dependent upon the aquatic wildlife as a prey source. It is believed that impacts on such species would not be significant.

It is also recommended that adequate precautions be taken to keep all forms of coal or other sediments form being inadvertently deposited along or within perennial stream channels. Similar precautions should be taken to preclude deposition of coal particles or sediments in or along other drainages form which the material could be transported during a precipitation event into a perennial stream. This would include blow-coal form haulage trucks, railroads or other transportation systems and storage piles. Control of larger coal particles from the above sources is equally important to control of fugitive dust. If needed, haulage vessels or storage sites should be covered, or the surface of the coal appropriately sprayed in order to solidify it against wind movement. Travel speeds of haulage vessels could be reduced so that coal is not allowed to leave the transportation system. The impacts of coal or other sediments on aquatic ecosystems are many and varied; therefore, sediments must be kept out of those systems.

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Utah division of Wildlife Resources reaffirms all of the recommendations in UMC 817.41 through 817.57 and UMC 817.126 for protecting the State's waters and their associated riparian and wetland zones along with the aquatic wildlife resource.

Mitigation and Impacts Avoidance Procedures For Terrestrial Habitats

It is recommended that all wetland and riparian habitats be maintained. Road and other facility development should not destroy or degrade these limited, highly productive and unique habitats. Roads crossing through those areas should do so in a manner that is least damaging to the habitat. Wetlands and riparian habitats are ranked as being of critical value and are the most productive sites in terms of herbage and biota produced as compared to other local habitat types. It is probable that a majority of the vertebrate wildlife that inhabit that project area make some use of riparian or wetland areas.

It is important to note that roads and other surface facilities to be constructed should as far as practicable be placed at sites where they will not compromise wildlife or their use areas. Also, surface facilities, including roads, should be screened of possible form wildlife use areas by vegetation or terrain.

In situations where wildlife habitats have been or will be disturbed, reclamation is required. Also, there are sites where development or enhancement of wild land habitats through vegetation treatments and/or seeding and transplants or seedlings could benefit wildlife. If circumstances arise where seed or seedling transplant for a recommended plant species are not available, suitable alternates are also recommended.

Seedling transplants form nursery stock as well as nearby rangelands would also be acceptable for some wild land treatments.

Appendix C represents an exhaustive list of commercial sources for plant materials for use in wild land treatments.

Temporary control of rodents may be required to ensure a successful rangeland treatment. It is recommended that the county agent be consulted in this area of concern. Poisoned oats are the most common and acceptable method for rodent control; however, only licensed persons may apply the treatment.

Currently, there are some new concepts in methodology for revegetation that are being successfully implemented in other parts of the nation and world. One promising method is a procedure where a large scoop removes, from a natural and stabilized site, a small area of earth intact with vegetation and subsurface soils for placement on a site to be restored. This same procedure can be utilized when disturbing pristine sites, except tat the native vegetation is stored for use in latent reclamation. Another meritorious method for stimulation natural revegetation, in combination with other reclamation techniques, is to plan facility developments so that islands of natural, native vegetation remain. This will allow for natural vegetation to spread form the islands. These techniques can also be useful for enhancement of poor quality sites that currently exist on the mine plan area.

Encapsulation of seed and fertilizer for several releases over a period of yr after a single application is a new and possible advantageous procedure. This technique along with soil stabilizing structures has been successfully used in South Africa. Dr. J. Van Wyk in the Department of Botany at Potchetstroom University in South Africa could provide additional information on this new technique.

There are also new specialized techniques coming to the forefront for stabilization of problem sites such as road banks and steep slopes. It is important that these sites be promptly and permanently revegetated in order to reduce siltation into local riverian systems. This will mitigate for damage to aquatic wildlife populations and habitats from siltation. Enhancement of existing problem sites or reclamation of disturbed sites can mitigate for salt loading of local river systems. It is believed that natural, no point sources represent 50 percent of the salinity in the upper basin of the Colorado River system into which this mine plan area drains.

It is recommended that Company make numerous contacts with appropriate agencies, institutions and persons to ensure that appropriate agencies, institutions and persons to ensure the enhancement or reclamation projects achieve the required degree of permanency, plant diversity, extent of cover and capability of regeneration to ensure plant succession. Generally speaking, seeding should be accomplished as late in the fall as possible. Seeding transplants need to be coordinated with local soil moisture conditions which are usually at optimum in the early spring just as the snow melts.

It is paramount that suitable vegetation be maintained and/or re-established if the life requirements of wildlife are to be satisfied in the post-mining period. Success in this area of concern along with cessation of man's disturbances will likely result in a natural renovation and the resultant inhabitation by most wildlife species of an impacted site.

It is important to note that enhancement or reclamation projects that are to benefit wildlife are to be satisfied in the post-mining period. Success in this area of concern along with cessation of man's disturbances will likely result in a natural renovation and the resultant inhabitation by most wildlife species of an impacted site.

It is important to note that enhancement or reclamation projects that are to benefit wildlife must be properly designed so that all the life requirements of the target species are considered in conjunction with forage. Water must be provided or be present and thermal cover along with escape and hiding cover has to be in abundance. Loafing areas and travel ways between the many types of use areas must also be provided. In order to meet these goals, a considerable degree of consultation will be required between the Company and Utah Division of Wildlife Resources.

As a service and also to ensure that the needs of wildlife are net, the various expertises within the Division of Wildlife Resources are available to the Company for consultation. For the most part, Larry Dalton, Resource Analyst, for the southeastern Regional office at 455 West Railroad Avenue in Price, Utah 84501 (phone 637-3310) will coordinate any needed contacts. Richard Stevens, Wildlife Biologist, at the Great Basin Research Center, Box 704, in Ephraim,

Utah 845627 (phone 283-4441) is available for consultation and site specific analysis concerning species for vegetation plantings, timing and techniques to achieve the best results.

In instances where revegetaion projects are to be planned over coal waste areas, heavy metal uptake by the plants must be evaluated. It is recommended that the Company initiate an appropriated long-term monitoring program to determine the magnitude and resolutions, if needed, for this problem.

It is recommended that persistent pesticides not be utilized on the project area. Other alternate pesticides of forms of control should be utilized.

All hazards associated with the project operation should be fenced or covered to preclude use by wildlife; of special concern would be sites having potential to entrap animals or toxic materials.

Mitigation and Impact Avoidance Procedures for Amphibians and Reptiles

Enhancement or development of habitats that provides a diversity of vegetation will benefit amphibians and reptiles. It is imported to note that all of these species are protected by Utah law. Due to the myriad and myths that surround these animals, it is urged that individual specimens not be destroyed. This is especially true for snakes since they are a valuable component of the ecosystem.

Snake dens are ranked as being of critical value to the population and are protected by law. If a den is located, it should be reported to the Utah Division of Wildlife Resources. Snake dens can be moved by the Division, but only with intensive efforts that may take a yr or more (snakes are caught and removed in the spring and fall). Thus, construction of facility developments may take place in denning locations if there is sufficient lead tome to relocated the occupants.

Mitigation and Impact Avoidance Procedures For Avifauna

It is recognizable that development and operation of a mining project will in some cases negatively impact may avian species through physical destruction of habitats and continual disturbance that makes other habitats unavailable or less desirable to an individual bird. It is also true that impacts that are negative to one species may be beneficial to another species. It is recommended that he Company plant native and/or ornamental berry producing shrubs around surface facilities. When mourning doves are a target species, sunflowers or blazing star should be planted. This will provide food and cover for many of the smaller species of birds, resulting in enhancement of their substantial value and high-priority habitats. This action would also mitigate for disturbances and destruction of avifauna habitats at other sites associated with project operations.

It is important to note that the nest of all avifauna (except the house sparrow, starling, and rock dove) when active and their eggs are protected by federal (Federal Migratory Bird Treaty Act) or state laws (Utah Code 23-17-1 and 23-17-2). All avifauna utilize a nest during their reproductive process. Dependent upon the species, some nests are well developed while others

may be represented by only a scrape on the ground. These sites when being utilized are critical to maintenance of individual bird populations; each species has a specific crucial time period in which the nest is occupied. It is during this crucial period that the nest must be protected form disturbance.

Several species of raptors frequent the project area. Their nests when active should not be disturbed and abandoned stick nests are never to be damaged. Every effort should be made to eliminate man's disturbance within visual sight or non-half kilometer radius of an active raptor nest. This distance would have to be increased to a one-kilometer radius if the cause for disturbance were to originate within view and from above the nest. This effort is demanded in the instance of golden eagles and cliff nesting falcons since they are sensitive to disturbed and could abandon the nest. Termination of man's use of a site would not be required if eagles or falcons constructed their nest after mining had been initiated, since it would demonstrate the individual bird's willingness to tolerate mining activities and the associated disturbance by man.

Roost trees for eagles, if located, must not be disturbed or destroyed. Similarly, activities planned for high-priority concentration areas of eagles must be designed implemented so that they are not of significant disturbance to the birds.

As a general comment, whenever active raptor nests are observed or roost trees for eagles located, they need to be reported to the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

Design and construction of all electrical power lines and other transmission facilities shall be designed in accordance with guidelines set forth in "Environmental Criteria for Electric Transmission System" published by the USDA and USDI in 1970 and/or the REA Bulletin 61-10 "Power line Contacts by Eagles and Other Large Birds." It is also recommended that placement of utility poles over flat or rolling terrain be planned so that they are out of view of roads or at least 300 meters away form any roads. This will lessen opportunity for illegal killing of these valuable birds, since the poles can serve as suitable hunting perches for raptors. In some instances poles can result in an extension of raptor hunting territories, which would represent a beneficial impact.

During the crucial period of December through February spruce-fir forest and aspen forests need to be protected form man's disturbance so that blue grouse and ruffed grouse will not be impacted. Destruction of these wildlife habitats at any time of the yr need be minimized due to their value to wildlife.

During the spring period (mid-March through mid-June) care needs to be taken that male blue grouse are not disturbed or precluded for establishing breeding territories. Similar precautions need be taken for male ruffed grouse (March through May) in the area of drumming logs.

Mature trees with natural cavities and dead snags need to be protected for use by cavity nesting birds. Trees with such a character are raked as being of critical value to cavity nesting

birds. The project should be planned so that three such trees are left standing per acre within 500 ft of forest openings or water and two such trees per acre in dense forested areas.

Mitigation and Impact Avoidance Procedures for Mammals

The lodges, nests and dens of all mammals or roosts in the instance of bat like mammals represent a critical use area for maintenance of their individual population. The crucial period for any species is when the lodge, den, nest or roost is occupied. Therefore, such sites for any mammal must be protected form disturbance during that period when it is being utilized.

Many species of mammals develop food caches in order to carry individual animals or family groups through periods when they cannot forage. Such sites are of critical value to maintenance of their populations and if located should not be destroyed or subjected to regular disturbance by man.

It is important to realize that within natural ecosystems there exists a predatory-prey relationship. One species of animal may represent a prey source for other species. Therefore, it is important that project operations be designed and implemented so as to not unnecessarily disturb or destroy any wildlife or their habitats.

Big game ungulates—mule deer, moose and elk—each have seasonal use areas ranked as being of critical value to an individual herd. Such sites need to be protected form any of man's activities or developments that could result in destruction, loss or permanent occupancy of the

site by man or has facility developments. If these types of impacts cannot be avoided the site must ultimately be reclaimed and revegetated. Also, critical valued areas need protection from disturbance during their appropriate crucial period.

High-priority valued use areas for all wildlife and particularly big game ungulates need to be protected from man's activities or facility developments. Actions that would result in loss or permanent occupancy of significant acreage (25 or more acres) of habitat are of special concern. In any event impacts to high-priority valued areas should be limited and ultimate reclamation planned. Many impacts can be avoided simply by precluding exploration, developmental or other activities during the period of time when a high interest species is present.

Haulage of coal between the various mine projects and distribution points should be planned so that impacts to wildlife are lessened; of special concern is haulage of coal through wintering areas for big game. It is recommended that the Company develop coal haulage contracts that require personnel involved with coal haulage to use extreme caution so that accidental collisions between motor vehicles and big game are reduced. Without doubt, a reduction in speed across winter ranges would alleviate this problem during the period between November 1 and May 15 each yr.

A reduction in speed of coal-haulage trucks and other mine related traffic and increased awareness of wildlife values by mine associated employees should result in a reduction of deer-highway mortality problems. Such a reduction would represent satisfactory mitigation.

In instances where conveyors, slurry lines or any other structure having potential to be a barrier to big game movement is to be developed, passage structures must be provided. Generally speaking overpass and underpass type structures are recommended in order to allow passage of big game to habitats either side of any barrier. These crossings should be placed at the pints to be identified from intensive stuffy of big game movements in relation to the mine plan area. Such study would not be required if the structure was adequately elevated to allow uninhabited passage of big game along its entire length.

Underpasses should have a min clearance of tree meters maintained across a span of at least five meters. Overpasses should be designed as a circular earthen ramp with the barrier bisecting the ramp into two equal halves as follows:

On either side of the conveyor a half-round ramp with a slope no greater than 3:1 on a five meters wide path placed at an angle 90 degrees to the conveyor and tapering around to a slope of 5:1 at paths adjacent to and parallel to the conveyor. The platform over the conveyor should be concrete or some other material that would not echo when being crossed by big game and should be of character similar to rock or natural earth.

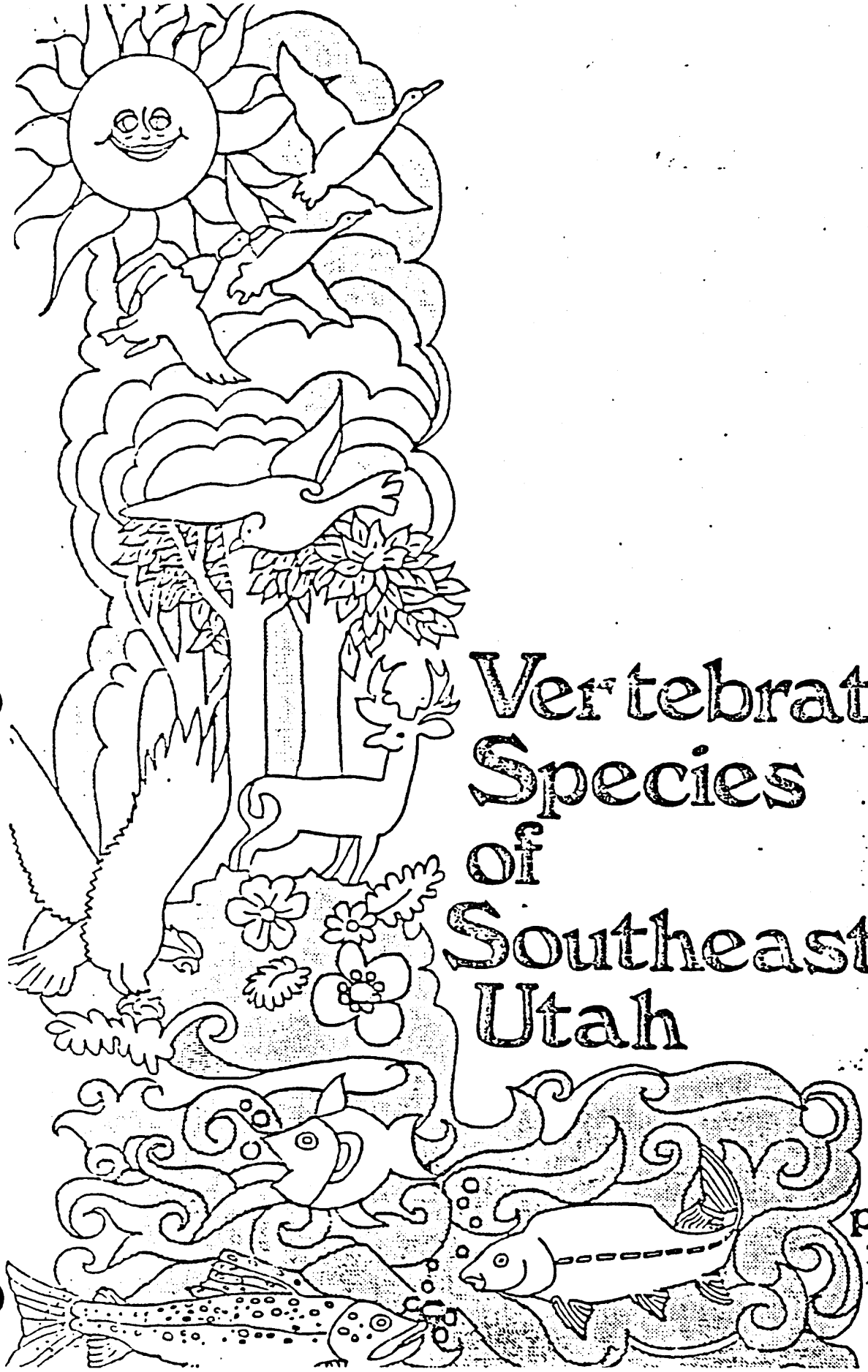
Soils associate with either crossing style should be of the A or B horizons to allow for development of vegetation. Vegetation cover must be established in association with all crossing sites. This will lessen anxiety of individual animals using the site through development of a natural appearing environment.

Mature pinion or juniper trees and an abundance of browse plants need to be placed proximal to crossing points in order to provide a safe travel way. The browse plants will also serve as a permanent attraction for big game to crossing points. Additionally, a mixture of grass and forbs seeds should be broadcast over each crossing point to stabilize the soil and enhance the forage situation.

Appropriately sized boulders may need to be placed at crossing sites in order to control of-road vehicles utilized in outdoor recreation.

Industrial developments are encouraged on habitats use areas that are ranked as being of limited value to wildlife. It should be noted, however, that reclamation is utilized expected on any wildlife use area, regardless of its value to wildlife.

VERTIBRATE SPECIES OF SOUTHEASTERN UTAH



Vertebrate Species of Southeastern Utah

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Agencies and individuals that have contributed information on species distribution within the southeastern region are acknowledged. Bureau of Land Management and U.S. Forest Service biologists provided information concerning local sightings and distribution of wildlife species. Species lists obtained from Arches and Canyonlands National parks were also helpful. Within the Utah Division of Wildlife Resources, local conservation officers and wildlife biologists provided valuable information on species within their districts or areas of experience. Thanks go to other Division personnel who assisted with review of this document.

The status and population trend for individual species is a product of the experience of the authors and others who have professional experience with the wildlife resource in southeastern Utah.

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Table 2. Classification of the 466 Species of Vertebrate Wildlife. 67

SPECIES LIST OF VERTEBRATE WILDLIFE THAT INHABIT SOUTHEASTERN UTAH

Utah is believed to be inhabited by 734 species of vertebrate wildlife. Four hundred forty-five of these species are protected: 2 amphibians, 2 reptiles, 26 mammals, 58 fish and 357 birds. One hundred of the protected species are game species: 10 species of big game; 20, fish; 10, furbearers; 43, migratory game birds; 5, small game mammals; and 12, upland, small game birds. Table 1 provides a comparison of inhabitation by game species between Utah Division of Wildlife Resource's five regions.

Southeastern Utah is inhabited by 466 species of vertebrate wildlife in six biogeographic areas (Table 2). Three hundred forty-three of these species are protected: 2 amphibians, 26 mammals, 38 fish and 277 birds. Seventy-nine of the protected species that inhabit southeastern Utah are game species: 9 species of big game; 13, game fish; 9, furbearers, 35, migratory game birds; 4, small game mammals; and 9, upland, small game birds.

Southeastern Utah has been divided into six biogeographic areas. Each area allows an overlap of wildlife species that inhabit contiguous low and high elevation areas. This procedure was utilized to reduce any controversy that would normally arise from a "sharp line" drawn on a map.

A- Wasatch Plateau extending east from Skyline Drive to Highway 10 and bounded on the north by Highway 6 and on the south by Interstate 70.
B- West Tavaputs Plateau including all drainages into the Price River drainage from Soldier's Summit east along Reservation Ridge and including the drainages into Argyle, Nine Mile and Minnie Maud creeks; bounded on the east by the Green River and south and west by Highway 6.
C- East Tavaputs Plateau bounded on the east by the Colorado-Utah state line; on the south by Interstate 70; on the west by the Green River and on the north by Uintah-Ouray Indian Reservation and the Uintah-Grand county line.
D- San Rafael Swell and San Rafael Desert bounded by Highway 6 on the north; Highway 10 on the west; the Green River on the east and the Emery-Wayne county line on the south.
E- Henry Mountains and Burr Desert bounded on the north by Emery-Wayne county line; the Green and Colorado rivers on the east; Lake Powell on the south and Capitol Reef National Park and the Waterpocket Fold on the west.
F- Mountains and deserts of Grand and San Juan counties south of Interstate Highway 70 and north of the San Juan River bounded on the east by the Utah-Colorado border and on the west by the Green and Colorado rivers and Lake Powell.

Each species is listed by common name followed by the generic and specific nomenclature. The status for each species was determined by the authors after evaluation and consultation from several sources. The listing for mammals was developed from Sparks (1974), Burt and Grossenheider (1976) and Durrant (1952). The primary sources consulted in compiling the bird list were Behle and Perry (1975) and Hayward et al. (1976) although, Peterson (1969), Robbins et al. (1966) and Udvardy and Rayfield (1977) were also used.

Holden (1973), Bailey et al. (1970), Eddy (1969) and Sigler and Miller (1963) were consulted for preparation of the list of fishes.

The status of reptiles and amphibians was determined through discussion with local herpetologists. The phylogenetic listing is after Stebbins (1966). Tanner (1975) was consulted for species inhabiting Utah.

The following code letters are given for each species to describe its status.

K Status unknown - It is believed that these species are present, but little is known of their population dynamics.
C Common - These species are widespread and abundant.
U Uncommon - These species are widespread, but not abundant.
R Rare - These species are seldom identified during any one year.
O Occasional - These species are periodically identified during a long term period--10-50 years.
A Accidental - Distribution for these species does not normally include this area. Sightings are as far between as 50 to 100 years.
E Endangered - These species are endangered with extinction or extirpation from wildland in Utah.
T Threatened - These species are threatened with becoming endangered in Utah.
L Limited - These species are common but restricted to a particular use area or habitat type in Utah.
X Extirpated - These species have disappeared from wildland habitats in Utah.
P Protected - These species are protected by state or federal laws in Utah.
N Nonprotected - These species are not protected by any laws in Utah.

The following terminology is used to describe the seasonal status for avian species.

Transient - These species pass through southeastern Utah twice a year during their migratory travels.

Resident - These species occur yearlong in southeastern Utah.

Summer Resident - These species breed in southeastern Utah and migrate elsewhere for the winter.

Winter Resident - These species breed elsewhere but winter in southeastern Utah.

Note, the species marked with an asteric (*) are of high interest to the State and those marked with an exclamation mark(!) have potential to inhabit the environs of the project area. *(High interest species are those defined as being of economic importance from either a consumptive or non-consumptive perspective, or having special aesthetic; scientific; educational or ecological significance.)*

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Fishes -- 38 species in southeastern Utah				
Family Clupeidae				
Threadfin Shad (Dorosoma petenense)	E,F	L-P	Stable	Lake-pelagic areas
Family Salmonidae				
* Cutthroat Trout (Salmo clarki)	A,B,D,F	C-P	Stable	Lakes-rocky shores, deep pelagic water; river-pools, riffles, and overhanging banks
* Rainbow Trout (Salmo gairdneri)	A,B,E,F,	C-P	Stable	Lake-littoral and pelagic areas rivers-pools, riffles, overhanging banks
* Brown Trout (Salmo trutta)	A,B,E,F	C-P	Stable	Lake-pelagic and littoral areas rivers-pools, riffles, and overhanging banks
* Brook Trout (Salvelinus fontinalis)	A,F	L-P	Stable	Lake-pelagic and littoral areas
Family Esocidae				
* Northern Pike (Esox lucius)	E,F	L-P	Unknown	Lake-littoral areas with submerged trees and brush
Family Cyprinidae				
Longfin Dace (Agosia chrysogaster)	E,F	K-P	Unknown	Unknown
Carp (Cyprinus carpio)	A,B,C,D,E,F	C-P	Stable	Lakes-littoral areas; quiet water areas in rivers, ponds, sloughs, creeks, and irrigation ditches
Utah Chub (Gila atraria)	A,B	L-P	Abundant	Irrigation ditches, ponds, sloughs, creeks, rivers, and lakes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Leatherside Chub (Gila copei)	A,E	C-P	Stable	Pool and riffle areas
* Humpback Chub (Gila cypha)	B	E-P	Decreasing	Eddies and backwaters
* Bonytail Chub Gila elegans)	B,C,F	E-P	Decreasing	Main channels of large rivers
Roundtail Chub (Gila robusta)	B,C,D,E,F	C-P	Stable	Riffles and stagnant backwaters
Red Shiner (Notropis lutrensis)	B,C,D,E,F	C-P	Increasing	Riffles, pools, backwaters, and eddies
San Shiner (Notropis stramineus)	F	C-P	Increasing	Riffles, pools, backwaters, and eddies
Fathead Minnow (Pimephales promelas)	B,C,D,E,F	C-P	Stable	Pools and backwaters
* Colorado Squawfish (Ptychocheilus lucius)	B,C,D,E,F	E-P	Decreasing	Slow waters, eddies, backwaters, and large pools
* Longnose Dace (Rhinichtys cataractae)	A	K-P	Unknown	Pools and riffles
Speckled Dace (Rhinichtys osculus)	A,B,C,D,E,F	C-P	Stable	Pools and riffles
Redside Shiner (Richardsonius balteatus)	A,B,D	C-P	Stable	Lakes, creeks and rivers
Family Catostomidae				
White Sucker (Catostomus commersoni)	E,F	U-P	Unknown	Unknown
Bluehead Sucker (Catostomus discobolus)	A,B,C,D,E,F	C-P	Unknown	Pools, riffles and lakes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Flannelmouth Sucker (Catostomus latipinnis)	B,C,D,E,F	C-P	Stable	Pools and riffles
Mountain Sucker (Catostomus platyrhynchus)	A	L-P	Stable	Pools and riffles
* Humpback Sucker (Xyrauchen texanus)	B,C,D,E,F	R-P	Decreasing	Large rivers with strong currents
Family Ictaluridae				
* Black Bullhead (Ictalurus melas)	B,C,D,E,F	C-P	Stable	Pools, quiet water and lakes
* Yellow Bullhead (Ictalurus natalis)	E,F	R-P	Stable	Quiet water areas and lakes
* Channel Catfish (Ictalurus punctatus)	B,C,D,E,F	C-P	Stable	Pools, riffles, quiet water areas and lakes
Family Cyprinodontidae				
Plains Killifish (Fundulus kansae)	F	R-P	Stable	Quiet water areas
Family Poeciliidae				
Mosquito fish (Gambusia affinis)	F	R-P	Stable	Quiet water areas
Family Cottidae				
* Mottled Sculpin (Cottus bairdi)	A	C-P	Stable	Rocky riffles and pool areas
Family Percichtyidae				
* Striped Bass (Morone saxatilis)	E,F	C-P	Increasing	Lake-pelagic areas
Family Centrarchidae				
Green Sunfish (Lepomis cyanellus)	B,C,D,E,F	C-P	Stable	Quiet backwaters and lakes
* Bluegill (Lepomis macrochirus)	E,F	C-P	Stable	Lakes-littoral areas with rocky shores and submerged brush

pecies	Area Inhabited	Status	Trend	Habitat Use Area
* Largemouth Bass (Micropterus salmoides)	A,B,C,D,E,F	C-P	Stable	Rivers-quiet water areas; lakes-littoral rocky areas, with submerged brush
* Black Crappie (Pomoxis nigromaculatus)	E,F	C-P	Stable	Lake-littoral zone around submerged brush and trees, and pelagic areas
Family Percidae				
* Perch (Perca flavescens)	F	U-P	Unknown	Unknown
* Walleye (Stizostedion vitreum)	E,F	C-P	Stable	Lake-deep water around rocky bottoms
mphibians -- 11 species in southeastern Utah				
Family Ambystomatidae				
* Tiger Salamander (Ambystoma tigrinum)	A,B,C,D,E,F	K-P	Unknown	Quiet water of ponds, reservoirs, lakes, temporary rain pools and streams from arid sagebrush plains to rolling grasslands, mountain meadows and forests
Family Pelobatidae				
Great Basin Spadefoot Toad (Scaphiopus intermontanus)	A,B,C,D,E,F	C-P	Unknown	Sagebrush flats, pinion-juniper woodlands to high elevations in spruce-fir communities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Spadefoot Toad (*Scaphiopus hammondi*)	F	K-P	Unknown	Washes, alkali flats, foothills, mountain valleys, in open vegetation and shortgrass, where soil is sandy and/or gravelly
Family Bufonidae				
Western Toad (*Bufo boreas*)	A	K-P	Unknown	Desert streams, springs, grasslands, woodlands, and mountain meadows
Red Spotted Toad (*Bufo punctatus*)	D,E,F,	C-P	Unknown	Open grassland and rocky canyons
Woodhouse's Toad (*Bufo woodhousei*)	A,B,C,D,E,F	C-P	Unknown	Grassland, sagebrush flats, woods, desert streams, valleys, flood plains, farms, and city backyards
Great Plains Toad (*Bufo cognatus*)	C,D,E,F,	C-P	Unknown	Prairies, deserts, quiet water of streams, grasslands and sagebrush plains
Family Hylidae				
Chorus Frog (*Pseudacris triseriata*)	A,B,C,D,F	C-P	Unknown	Grassy pools, lakes, and marshes of prairies or mountains

cies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Canyon Tree Frog (Hyla arenicolor)	E,F	L-p	Unknown	Intermittant or permanent streams with rocky pools in canyons with cottonwoods or other trees
Family Ranidae				
*Bullfrog (Rana catesbeiana)	F	L-P	Declining	Colorado River-usually quiet water where there is thick growth of aquatic vegetation
Leopard Frog (Rana pipiens)	A,B,C,D,E,F	C-P	Unknown	Springs, creeks, rivers, ponds, canals, reservoirs and wet meadows
tiles -- 36 species in southeastern Utah				
Family Iguanidae				
*Chuckwalla (Sauromalus obesus)	E,F	L-P	Unknown	Rocky hillsides
! Collared Lizard (Crotaphytus collaris)	A,B,C,D,E,F	C-P	Unknown	Canyons, rocky gullies, mountain slopes and boulder strewn alluvial fans where vegetation is sparse
! Leopard Lizard (Crotaphytus wislizenii)	A,B,C,D,E,F	C-P	Unknown	Arid and semi-arid plains with bunchgrass, sagebrush or other low desert shrub communities; avoids dense vegetation
Lesser Earless Lizard (Holbrookia maculata)	F	K-P	Unknown	Washes, sandy stream banks and sand dunes on shortgrass prairi and farmlands

ecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Eastern Fence Lizard (Sceloporus undulatus)	A,B,C,D,E,F	C-P	Unknown	Forest, woodlands, prairie, brushy flatlands, sand dunes, rocky hillsides and farmlands
Desert Spiny Lizard (Sceloporus magister)	D,E,F	C-P	Unknown	Shadscale deserts, pinion-juniper woodland, willows and cottonwoods.
! Sagebrush Lizard (Sceloporus graciosus)	A,B,C,D,E,F	C-P	Unknown	Variety of habitat types; sagebrush, pinion-juniper, low desert shrub and rocklands
! Tree Lizard (Urosaurus ornatus)	A,B,C,D,E,F	C-P	Unknown	Trees and rocks
! Side-blotched Lizard (Uta stansburiana)	A,B,C,D,E,F	C-P	Unknown	Inhabits a variety of habitat types; sandy washes with scattered rocks and low growing shrubs
Desert Horned Lizard (Phrynosoma platyrhinos)	E	K-P	Unknown	Along washes at the edge of dunes in saltbrush and sagebrush areas
! Short-horned Lizard (Phrynosoma douglassi)	A,B,C,D,E,F	C-P	Unknown	Desert grassland, sagebrush, pinion-juniper, pine-spruce and spruce-fir associations, extending from desert shrub to mountain habitats

cies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Xantusiidae				
* Utah Night Lizard (Xantusia vigilis)	E,F	L-P	Unknown	Dead clumps of yucca plants and woodrat middens
Family Teiidae				
Plateau Whiptail (Cnemidophorus velox)	F	K-P	Unknown	Mountains in pinion-juniper woodland and lower edges of ponderosa pine forests
Western Whiptail (Cnemidophorus tigris)	A,B,C,D,E,F	C-P	Unknown	Desert shrub communities where plants are sparse and there are open areas for running
Family Scincidae				
Many-lined Skink (Eumeces multivirgatus)	E,F	K- P	Unknown	Shortgrass prairie that extends into the mountains; often vacant lots, city dumps and backyards
Western Skink (Eumeces skiltonianus)	C	K- P	Unknown	Grasslands, woodlands and forests in rocky habitat near streams with abundant cover
Family Boidae				
Rubber Boa (Charina bottae)	A	C- P	Unknown	Grasslands, woodlands, and forests with rotting logs; often found under rocks and under the bark of fallen or standing dead trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Colubridae				
Smooth Green Snake (Opheodrys vernalis)	F	K-P	Unknown	Damp grassy environment
! Striped Whipsnake (Masticophis taeniatus)	A,B,C,D,E,F	C-P	Unknown	Brushlands, grasslands, sagebrush flats, pinion-juniper woodlands and open pine forests
Coachwhip (Masticophis flagellum)	E,F	K-P	Unknown	Utilizes a variety of habitats but avoids dense vegetation; rodent burrows, rocks and branches are used
! Racer (Coluber constrictor)	A,B,C,D,E,F	C-P	Unknown	Meadows, sparse brush and forest openings with semi-arid and moist areas; grassy places near rocks and logs are preferred
Corn Snake (Elaphe guttata)	F	K-P	Unknown	Stream and river bottoms, rocky wooded hillsides, coniferous forests, and farmland with rodent burrows, rocks and logs
Ringneck Snake (Diadophis punctatus)	A	K-P	Unknown	Moist habitats usually in the mountains or along stream and river bottoms

cies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Gopher Snake (*Pituophis melanoleucus*)	A,B,C,D,E,F	C-P	Unknown	Lowlands to high mountains including desert, coniferous forest and farmland types; grassland and open brushland are prescribed
! *Milk Snake (*Lampropeltis triangulum*)	A,B,C,F	L-P	Unknown	Variety of habitats from lowlands to mountains; rotten logs and stumps are preferred
Common Kingsnake (*Lampropeltis getulus*)	E,F	K-P	Unknown	Variety of habitats from lowlands to mountains with rock outcrops and clumps of vegetation under rotting logs or rocks
! *Sonora Mountain Kingsnake (*Lampropeltis pyromelana*)	A	L-P	Unknown	Mountains, pinion-juniper woodlands, mountain brush, coniferous forests with rocks, logs and dense clumps of vegetation
Long-nosed Snake (*Rhinocheilus lecontei*)	F	K-P	Unknown	Prairies, brushland and irrigated parts of deserts
! Western Terrestrial Garter Snake (*Thamnophis elegans*)	A,B,C,D,E,F	C-P	Unknown	Variety of terrestrial and aquatic habitats from lowlands to mountains
! Common Garter Snake (*Thamnophis sirtalis*)	A,F	K-P	Unknown	Variety of habitats, usually near water

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Black-necked Garter Snake (*Thamnophis cyrtopsis*)	F	K-P	Unknown	Desert and grasslands
Western Black-headed Snake (*Tantilla planiceps*)	E,F	K-P	Unknown	Grasslands, woodlands and deserts; often found under rocks and logs
! Night Snake (*Hypsiglena torquata*)	A,B,C,D,E,F	C-P	Unknown	Plains, sagebrush flats, desert and woodlands; often found under rocks and surface litter
Family Crotalidae				
Hopi Rattlesnake (*Crotalus viridis nuntius*)	E	U-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts
Prairie Rattlesnake (*Crotalus viridis viridis*)	F	U-P	Unknown	Prefers rock piles and rodent burrows on grasslands, woodlands and forests; avoids sparsely vegetated deserts
! Midget Faded Rattlesnake (*Crotalus viridis concolor*)	A,B,C,D,E,F	C-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts

ecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
rds -- 278 species in southeastern Utah				
Order Gaviiformes				
Family Gaviidae				
Common Loon (Gavia immer)	A,B,C,D,E,F	U-P transient and winter resident	Stable	Lakes of coniferous forests, open lakes, reservoirs and bays
Order Podicipediformes				
Family Podicipedidae				
Horned Grebe (Podiceps auritus)	A,B,C,D,E,F	R-P transient and summer resident	Stable	Lakes, ponds and reservoirs
Eared Grebe (Podiceps nigricollis)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, bays and reservoirs
* Western Grebe (Aechmophorus occidentalis)	A,B,C,D,E,F	K-P summer resident	Unknown	Sloughs, bays and reservoirs and lakes with emergent vegetation for nesting
Pied-billed Grebe (Podilymbus podiceps)	A,B,C,D,E,F	C-P summer resident	Stable	Ponds, lakes, streams and marshes
Order Pelecaniformes				
Family Pelecanidae				
* White Pelican (Pelecanus erythrorhynchos)	A,B,C,D,E,F	L-P transient and summer resident	Stable	Larger shallow bodies of water and large rivers
Family Phalacrocoracidae				
* Double-crested Cormorant (Phalacrocorax auritus)	A,B,C,D,E,F	K-P summer resident	Unknown	Bays, lakes and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Ciconiiformes				
Family Ardeidae				
*Great Blue Heron (Ardea herodias)	A,B,C,D,E,F	K-P resident	Unknown	Marshes, shallow reservoirs, rivers, streams, shores and irrigation ditches
Green Heron (Butorides striatus)	B,E,F	R-P transient	Unknown	Marshes, wooded streams, rivers, small ponds and lake margins
Cattle Egret (Bubulcus ibis)	E,F	O-P transient	Unknown	Marshes, lake margins, and irrigated lands
Snowy Egret (Egretta thula)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, ponds, lake margins and irrigated land
Black-crowned Night Heron (Nycticorax nycticorax)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, lake margins and shores
Least Bittern (Ixobrychus exilis)	D,E,F	U-P transient	Unknown	Densely vegetated marshes
American Bittern (Botaurus lentinginosus)	A,B,C,D,E,F	U-P summer resident	Stable	Densely vegetated marshe
Family Ciconiidae				
Wood Stork (Mycteria americana)	D,E,F	O-P transient	Unknown	Marshes, ponds and lake margins
Family Threskiornithidae				
*White-faced Ibis (Plegadis chihi)	A,B,C,D,E,F	K-P summer resident	Unknown	Marshes and irrigated land

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Anseriformes				
Family Anatidae				
* Whistling Swan (Olor columbianus)	A,B,C,D,E,F	O-P winter resident C-P transient	Stable	Lakes, large rivers and fields
* Trumpeter Swan (Olor buccinator)	B,C,D,E,F	R-P transient	Unknown	Lakes and large rivers
* Canada Goose (Branta canadensis)	A,B,C,D,E,F	C-P resident and transient	Increasing	Lakes, bays, marshes, rivers and grainfields
* White-fronted Goose (Anser albifrons)	A,B,C,D,E,F	R-P transient	Stable	Marshes, fields, lakes and bays
* Snow Goose (Chen caerulescens)	A,B,C,D,E,F	U-P transient	Stable	Marshes, grainfields, reservoir, ponds and bays
* Ross' Goose (Chen rossii)	A,B,C,D,E,F	O-P transient	Stable	Marshes, grainfields, prairies, ponds and bays
* Mallard (Anas platyrhynchos)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, grainfields, ponds, rive lakes, bays and reservoi extending from lowlands mountains
* Gadwall (Anas strepera)	A,B,C,D,E,F	C-P resident and transient	Stable	Lakes, ponds, rivers and marshes
* Pintail (Anas acuta)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, grainfields, ponds, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Green-winged Teal (Anas crecca)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, lakes, ponds, rivers and bays
*Blue-winged Teal (Anas discors)	A,B,C,D,E,F	U-P resident and transient	Stable	Ponds and marshes
*Cinnamon Teal (Anas cyanoptera)	A,B,C,D,E,F	C-P resident and transient	Stable	Stock ponds, rivers, marshes and lakes
*American Widgeon (Anas americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, ponds, lakes and bays
* Northern Shoveler (Anas clypeata)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds and sloughs
*Wood Duck (Aix sponsa)	A,B,C,D,E,F	R-P transient	Stable	Wooded rivers and ponds
*Redhead (Aythya americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes with some deep water, lakes and reservoirs
*Ring-necked Duck (Aythya collaris)	A,B,C,D,E,F	U-P transient	Stable	Coniferous lakes, wooded ponds, marshes and reservoirs
*Canvasback (Aythya valisineria)	A,B,C,D,E,F	C-P transient R-P summer resident	Stable	Marshes, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Greater Scaup (Aythya marila)	A,B,C,D,E,F	U-P transient	Stable	Lakes, rivers and ponds
*Lesser Scaup (Aythya affinis)	A,B,C,D,E,F	C-P transient	Stable	Marshes, ponds and lakes
*Common Goldeneye (Bucephala clangula)	A,B,C,D,E,F	U-P transient	Stable	Lakes and rivers
*Bufflehead (Bucephala albeola)	A,B,C,D,E,F	U-P transient	Stable	Lakes, ponds and rivers
*White-winged Scoter (Melanitta deglandi)	D	O-P transient	Stable	Large lakes and reservoirs. Recorded occurrence at Desert Lake WMA
*Ruddy Duck (Oxyura jamaicensis)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds, rivers and reservoirs
*Hooded Merganser (Mergus cucullatus)	A,B,C,D,E,F	R-P transient	Stable	Wooded lakes, ponds, rivers and reservoirs
*Common Merganser (Mergus merganser)	A,B,C,D,E,F	C-P transient U-P winter resident	Stable	Wooded lakes and rivers in summer; in winter, open rivers, lakes and ponds
*Red-breasted Merganser (Mergus serrator)	A,B,C,D,E,F	C-P transient	Stable	Lakes, reservoirs and rivers

ecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Falconiformes				
Family Cathartidae				
! *Turkey Vulture (Cathartes aura)	A,B,C,D,E,F	C-P summer resident	Stable	Usually seen in sky or perched on dead trees, posts, carrion or on groun
California Condor (Gymnogyps californianus)	A,B,C,D,E,F	X-P	Extirpated	Usually seen in sky or perched on dead trees, posts, carrion or on groun
Family Accipitridae				
*Goshawk (Accipiter gentilis)	A,B,C,D,E,F	U-P resident	Stable	Mountain woodlands
*Sharp-shinned Hawk (Accipiter striatus)	A,B,C,D,E,F	U-P resident and transient	Stable	Forests, thickets, scruboak, desert riparian, mountain woodlands and aspen
*Cooper's Hawk (Accipiter cooperii)	A,B,C,D,E,F	C-P summer resident and transient R-P winter resident	Stable	Broken woodlands, dry wooded canyons, riparian areas, pinion-juniper and conifers
! *Red-tailed Hawk (Buteo jamaicensis)	A,B,C,D,E,F	C-P resident	Stable	Open country, woodlands, mountains and deserts
*Red-shouldered Hawk (Buteo lineatus)	C,F	A-P transient	Unknown	Broken woodlands, primarily along lowland rivers and often close to cultivated fields
! * Swainson's Hawk (Buteo swainsoni)	A,B,C,D,E,F	U-P summer resident	Stable	Dry plains and rangeland with hills; open forest or alpine meadows with sparse trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Rough-legged Hawk (Buteo lagopus)	A,B,C,D,E,F	C-P winter resident	Stable	Open country, woodlands deserts and marshes
* Ferruginous Hawk (Buteo regalis)	A,B,C,D,E,F	U-P summer resident R-P winter resident	Stable	Open desert; infrequent marshes and farmlands are utilized
* Golden Eagle (Aquila chrysaetos)	A,B,C,D,E,F	C-P resident	Stable	Open mountains, foot-hills, canyons and dese
*Bald Eagle (Haliaeetus leucocephalus)	A,B,C,D,E,F	E-P winter resident	Increasing	Lakes, rivers and marsh surrounded by open country with available perching sites
*Marsh Hawk (Circus cyaneus)	A,B,C,D,E,F	C-P resident	Stable	Marshes, fields and prairies
Family Pandionidae				
*Osprey (Pandion haliaetus)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and large bodies of water
Family Falconidae				
*Prairie Falcon (Falco mexicanus)	A,B,C,D,E,F	C-P resident	Stable	Canyons, open habitat in mountains, plains and deserts
*Peregrine Falcon (Falco peregrinus)	A,B,C,D,E,F	E-P resident	Unknown	Canyons, high cliffs, rivers, marshlands and deserts
*Merlin (Falco columbarius)	A,B,C,D,E,F	K-P winter resident	Unknown	Open country and foot-hills; often associated with flocking passerine

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* American Kestrel (Falco sparverius)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Stable	Open country, prairies, deserts, wooded streams, farmland and cities
Order Galliformes				
Family Tetraonidae				
* Blue Grouse (Dendragapus obscurus)	A,B,C,D,E,F	C-P resident	Stable	Coniferous forests, aspen, mountain brush, open slash and burns
* Ruffed Grouse (Bonasa umbellus)	A,B	C-P resident	Stable	Aspen and coniferous forests near stream courses
* Sage Grouse (Centrocercus urophasianus)	A,B,C,F	C-P resident	Stable	Sagebrush plains associated with pasture lands; sagebrush parks associated with wet meadows
Family Phasianidae				
* California Quail (Lophortyx californicus)	A,B,D,E,F	C-P resident	Stable	Mountain brush, woodland edges and farmlands near river bottoms
* Gambels Quail (Lophortyx gambelii)	D,E,F	C-P resident	Stable	Desert thickets, usually near water
* Chukar (Alectoris chukar)	A,B,C,D,E,F	C-P resident	Stable	Rocky, grassy or brushy slopes in arid mountains and canyons
* Ring-necked Pheasant (Phasianus colchicus)	A,B,C,D,E,F	C-P resident	Decreasing	Irrigated cropland, pastureland, wetlands and desert washes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* White-winged Pheasant (Phasianus colchicus)	E,F	L-P resident	Decreasing	Irrigated cropland, pastureland and wetlan near Hanksville and Bluff, Utah
Family Meleagrididae				
* Merriam's Turkey (Meleagris gallapavo)	F	L-P resident	Stable	Mountainous regions wi Ponderosa pine, mixed conifer and aspen wood- lands or mountain brus
Order Gruiformes				
Family Gruidae				
* Sandhill Crane (Grus canadensis)	A,B,C,D,E,F	L-P transient	Stable	In winter, prairies grainfields and marshe in summer, mountain meadows and marshes
Family Rallidae				
* Virginia Rail (Rallus limicola)	A,B,C,D,E,F	C-P resident	Stable	Marshes
* Sora Rail (Porzana carolina)	A,B,C,D,E,F	U-P resident	Stable	Marshes and wet meadow:
* Common Gallinule (Gallinula chloropus)	A,D	R-P transient	Unknown	Marshes, wet meadows, lakes with bulrush or cattails and sedges
* American Coot (Fulica americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Ponds, lakes, marshes, and agricultural lands adjacent to wetland habitats.
Order Charadriiformes				
Family Charadriidae				
Semipalmated Plover (Charadrius semipalmatus)	A,B,C,D,E,F	U-P transient	Stable	Shores of marshes, reservoirs and mudflats

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Snowy Plover (Charadrius alexandrinus)	A,B,C,D,E,F	K-P transient	Unknown	Alkali and sand flats
Killdeer (Charadrius vociferus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Fields and pastures, lawns, riverbanks, irrigated land, shores, plowed fields, alkali flats and gravel roads
! Mountain Plover (Charadrius montanus)	A,B,C,F	R-P transient	Stable	Semi-arid grasslands, plains and plateaus
American Golden Plover (Pluvialis dominica)	A,B,C,D,E,F	U-P transient	Stable	Prairies, mudflats and shores
Black-bellied Plover (Pluvialis squatarola)	A,B,C,D,E,F	C-P transient	Stable	Mudflats, open marshes and shores
Family Scolopacidae				
* Common Snipe (Capella gallinago)	A,B,C,D,E,F	C-P resident	Stable	Marshes, irrigation ditches, stream sides, and wet meadows
* Long-billed Curlew (Numenius americanus)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Meadows, pastures and wetlands
* Willet (Catoptrophorus semipalmatus)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Marshes, wet meadows and muddy shores
Spotted Sandpiper (Tringa macularia)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Pebbly lake shores, ponds and stream sides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Solitary Sandpiper (Tringa solitaria)	A,B,C,D,E,F	U-P transient	Stable	Stream sides, ponds and marshes
Greater Yellowlegs (Tringa melanoleuca)	A,B,C,D,E,F	U-P transient	Stable	Open marshes, mudflats, streams and ponds
Lesser Yellowlegs (Tringa flavipes)	A,B,C,D,E,F	C-P transient	Stable	Marshes, mudflats, shores and pond edges
Pectoral Sandpiper (Calidris melanotos)	A,B,C,D,E,F	U-P transient	Stable	Prairie pools and marshy shores
Baird's Sandpiper (Calidris bairdii)	A,B,C,D,E,F	U-P transient	Stable	Rainpools, pond margins mudflats and shores
Least Sandpiper (Calidris minutilla)	A,B,C,D,E,F	C-P transient	Stable	Grassy marshes, rain-pools, shores and alkal mudflats
Western Sandpiper (Calidris mauri)	A,B,C,D,E,F	C-P transient	Stable	Shores, beaches, mud-flats and open marshes
Sanderling (Calidris alba)	A,B,C,D,E,F	U-P transient	Stable	Lake shores
Short-billed Dowitcher (Limnodromus griseus)	A,B,C,D,E,F	U-P summer resident and transient	Stable	Mudflats, open marshes and ponds
Long-billed Dowitcher (Limnodromous scolopaceus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Mudflats, shallow pools and wetlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Marbled Godwit (Limosa fedoa)	A,B,C,D,E,F	C-P transient	Stable	Grasslands and meadows near lakes and shallow lake margins
Family Recurvirostridae				
American Avocet (Recurvirostra americana)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, mudflats, alkaline lakes, shallow ponds and sloughs
Black-necked Stilt (Himantopus mexicanus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Grassy marshes, alkali mudflats, pools and shallow lakes
Family Phalaropodidae				
Wilson's Phalarope (Phalaropus tricolor)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Shallow lakes, marshes, pools, shores and mudflats
Northern Phalarope (Phalaropus lobatus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Lakes and ponds
Family Laridae				
Glaucous Gull (Larus hyperboreus)	D	R-P transient	Stable	Recorded using marshlands at Desert Lake WMA
Herring Gull (Larus argentatus)	A,B,C,D,E,F	U-P transient	Stable	Lakes, farmlands and dumps
California Gull (Larus californicus)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, rivers, farmlands and dumps
Ring-billed Gull (Larus delawarensis)	A,B,C,D,E,F	C-P winter resident	Stable	Lakes, rivers, refuse dumps, fields and cities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Franklin's Gull (Larus pipixcan)	A,B,C,D,E,F	C-P summer resident	Stable	Prairies, marshes, lakes and plowed fields
Bonaparte's Gull (Larus philidelphia)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and open marshes
Forsters Tern (Sterna forsteri)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Common Tern (Sterna hirundo)	A,B,C,D,E,F	U-P transient	Stable	Lakes and reservoirs
Black Tern (Chlidonias niger)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Caspian Tern (Hydroprogne caspia)	A,B,C,D,E,F	U-P transient	Stable	Large lakes and reservoirs
Order Columbiformes				
Family Columbidae				
* Band-tailed pigeon (Columba fasciata)	A,E,F	U-P summer resident and transient	Stable	Forests, canyons and foothills near mountain brush (acorns) and agricultural lands
Rock Dove (Columba lavia)	A,B,C,D,E,F	C-N resident	Stable	Cities, farms and cliffs
! * Mourning Dove (Zenaida macroura)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Farmlands, towns, open woods, grassland and deserts
White-winged Dove (Zenaidura asiatica)	E,F	A-P summer resident and transient	Unknown	Open woods and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Cuculiformes				
Family Cuculidae				
* Yellow-billed Cuckoo (Coccyzus americanus)	A,B,C,D,E,F	K-P summer resident	Unknown	River thickets and willows
Order Strigiformes				
Family Tytonidae				
* Barn Owl (Tyto alba)	A,B,C,D,E,F	K-P resident	Unknown	Woodlands, fields, farms, towns, canyons, cliffs an dirt banks
Family Strigidae				
* Screech Owl (Otus asio)	A,B,C,D,E,F	U-P resident	Stable	Riparian communities and wooded canyons
* Flammulated Owl (Otus flammeolus)	A,B,C,D,E,F	K-P summer resident	Unknown	Open pine and fir forests in mountains
* Great Horned Owl (Bubo virginianus)	A,B,C,D,E,F	C-P resident	Stable	Ubiquitous
* Pygmy Owl (Glaucidium gnoma)	A,B,C,D,E,F	K-P resident	Unknown	Wooded canyons in open coniferous, mixed woodlands and pinion-juniper forests
* Burrowing Owl (Speotyto cunicularia)	A,B,C,D,E,F	L-P resident	Declining	Open grassland, prairies, dikes, desert, farms and prairie dog colonies

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Spotted Owl (Strix occidentalis)	C,E	L-P Unknown	Unknown	Wooded canyons with narrow side canyons in the desert
* Long-eared Owl (Asio otus)	A,B,C,D,E,F	C-P resident	Stable	River woodlands, pinion-juniper forests, willow thickets and Russian olive trees
* Short-eared Owl (Asio flammeus)	A,B,C,D,E,F	C-P resident	Stable	Marshes, prairies, irrigated land and open country with short vegetation
* Saw-whet Owl (Aegolius acadicus)	A,B,C,D,E,F	K-P resident	Stable	Forest, conifers and groves
Order Caprimulgiformes				
Family Caprimulgidae				
Common Nighthawk (Chordeiles minor)	A,B,C,D,E,F	C-P summer resident	Stable	Treeless plains to mountains with open pine woods; often seen in fli over country side or tov
Lesser Nighthawk (Chordeiles acutipennis)	E	R-P summer resident	Unknown	Arid open scrub, dry grasslands, pastures and desert washes
Poor-will (Phalaenoptilus nuttallii)	A,B,C,D,E,F	C-P summer resident	Stable	Arid uplands with open pinion-juniper and spar: brush; riparian areas ar roadsides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Apodiformes				
Family Apodidae				
*Black Swift (Cypseloides niger)	A,B,C,D,E,F	U-P summer resident	Unknown	Open areas in mountain country
White-throated Swift (Aeronautes saxatalis)	A,B,C,D,F	C-P summer resident	Unknown	Open areas; wide ranging and breeds mainly in dry mountain canyons
Family Trochilidae				
Black-chinned Hummingbird (Archilochus alexandri)	A,B,C,D,E,F	C-P summer resident	Unknown	Semi-arid country near water; semi-wooded canyons and slopes, mountain brush and riparian woodlands
Broad-tailed Hummingbird (Selasphorus platycercus)	A,B,C,D,E,F	C-P summer resident	Unknown	Ubiquitous
Rufous Hummingbird (Selasphorus rufus)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Forest edges, thickets in coniferous and deciduous forests, mountain brush and alpine meadows
Calliope Hummingbird (Stellula calliope)	A,B,C,D,E,F	C-P summer resident	Unknown	High mountains, canyons and forest openings
Rivoli's Hummingbird (Eugenes fulgens)	E,F	U-P summer resident	Unknown	High mountain forest openings, pine-oak forests and canyons

Species	Area Inhabited	Status	Trend	Habitat Use Area
Order Caraciiformes				
Family Alcedinidae				
* Belted Kingfisher (Megaceryle alcyon)	A,B,C,D,E,F	K-P resident	Unknown	Rivers, ponds and lakes
Order Piciformes				
Family Picidae				
! Common Flicker (Colaptes auratus)	A,B,C,D,E,F	C-P resident	Stable	Deciduous or mixed woodlands, open forest, farms towns, canyons and semi-open country
* Pileated Woodpecker (Dryocopus pileatus)	F	K-P resident	Unknown	Mature coniferous and mixed forests with many snags
Red-headed Woodpecker (Melanerpes erythrocephalus)	B	R-P resident	Unknown	Groves, farm country, riparian areas, towns and scattered trees
! Yellow-bellied Sapsucker (Sphyrapicus varius)	A,B,C,D,E,F	C-P resident	Unknown	In summer woodlands and aspen groves; in winter orchards and other trees
* Williamson's Sapsucker (Sphyrapicus thyroideus)	F	U-P summer resident	Unknown	Higher coniferous forests and burns
* Lewis Woodpecker (Asyndesmus lewis)	F	K-P summer resident and transient	Unknown	Scattered or logged forests, burns, cottonwood groves and ponderosa pine
! Hairy Woodpecker (Dendrocopos villosus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain forests, woodlands and river groves

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Downy Woodpecker (Dendrocopos pubescens)	A,B,C,D,E,F	C-P resident	Unknown	Broken or mixed forest, willows, poplars, ripar woodlands, orchards and shade trees
Northern Three-toed Woodpecker (Picoides tridactylus)	A,B,C,E,F	U-P resident	Unknown	Coniferous forests
Order Passeriformes				
Family Tyrannidae				
Western Kingbird (Tyrannus verticalis)	A,B,C,D,E,F	C-P summer resident	Stable	Open country with scattered trees, farms and roadsides
Cassin's Kingbird (Tyrannus vociferans)	A,B,C,D,E,F	U-P summer resident	Unknown	Semi-open high country, scattered trees, pine-oak mountains and ranch groves
Eastern Kingbird (Tyrannus tyrannus)	A,B,C,D,E,F	C-P summer resident	Unknown	Wood edges, parklands, riparian areas, farms, shelter belts, orchards and roadsides
Ash-throated Flycatcher (Myiarchus cinerascens)	A,B,C,D,E,F	C-P summer resident	Stable	Semi-arid country, deserts, brush, pinion-juniper and open woods
Black Phoebe (Sayornis nigricans)	F	C-P resident	Unknown	Streamside woodlands, farmyards and towns with cliffs near water
Says Phoebe (Sayornis saya)	A,B,C,D,E,F	C-P resident	Unknown	Open arid country, deserts, bushy plains, prairie farms, canyon

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Willow (Traill's) Flycatcher (Empidonax traillii)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in willow thickets in low valleys, along canyons or in high mountain meadows
Hammond's Flycatcher (Empidonax hammondii)	A,B,C,E,F	U-P summer resident	Unknown	High coniferous forests
Dusky Flycatcher (Empidonax oberholseri)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in mountain brush with a scattering of trees
Gray Flycatcher (Empidonax wrightii)	A,B,C,D,E,F	K-P summer resident	Unknown	Breeds in sagebrush and pinion-juniper woodlands
Western Flycatcher (Empidonax difficilis)	A,B,C,D,E,F	C-P summer resident	Unknown	Moist woods, mixed or coniferous forests, canyons, groves; must have water and shade
Western Wood Peewee (Contipus sordidulus)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands, pine-oak forests, open conifers and river groves
Olive-sided Flycatcher (Contopus borealis)	A,B,C,D,E,F	U-P summer resident	Unknown	Coniferous forests, burns and clearings; in migration habitats used are varied; usually seen on tip of dead tree or branch

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Alaudidae				
Horned Lark (*Eremophila alpestris*)	A,B,C,D,E,F	C-P resident	Unknown	Plains, desert, prairies fields, sparse sagebrush flats, dirt roads, shore: alpine meadows, alkali flats and areas of sparse vegetation
Family Hirundinidae				
Violet-green Swallow (*Tachycineta thalassina*)	A,B,C,D,E,F	C-P summer resident	Unknown	Widespread when foraging; when nesting, open forest foothill woods, mountain: canyons, cliffs and towns
Tree Swallow (*Iridoprocne bicolor*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country near water, marshes, mountain meadows streams, lakes and wires; when nesting requires dea trees and snags, preferab near water
Bank Swallow (*Riparia riparia*)	A,B,C,D,E,F	C-P summer resident	Unknown	Usually near water; over fields, marshes, streams and lakes
Rough-winged Swallow (*Stelgidopteryx ruficollis*)	A,B,C,D,E,F	C-P summer resident	Unknown	Near streams, lakes and washes
Barn Swallow (*Hirundo rustica*)	A,B,C,D,E,F	C-P summer resident	Unknown	Open or semi-wooded country, farms, ranches, fields, marshes and lakes usually near man's habitation

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Cliff Swallow (Petrochelidon pyrrhonota)	A,B,C,D,E,F	C-P summer resident	Unknown	Open to semi-wooded country, neat farms, cliffs, canyons, rivers or lakes
* Purple Martin (Progne subis)	A,B,C,E,F	R-P summer resident	Unknown	Open forests of aspen and conifers
Family Corvidae				
! Steller's Jay (Cyanocitta stelleri)	A,B,C,D,E,F	C-P resident	Unknown	Conifers and pine-oak forests
Gray Jay (Perisorius canadensis)	A,B,C,E,F	R-P resident	Unknown	Coniferous forests
! Scrub Jay (Aphelocoma coerulescens)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, oaks, mountain brush, river woods and pinion-junipe woodlands
! Black-billed Magpie (Pica pica)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, ranches, sag brush, river thickets, shelterbelts and prairi brush
! Common Raven (Corvus corax)	A,B,C,D,E,F	C-P resident	Unknown	Mountains, deserts, canyons and cliffs
! Common Crow (Corvus brachyrhynchos)	A,B,C,D,E,F	O-P transient	Unknown	Deciduous, mixed and open coniferous woodland farmlands and river grov
! Pinion Jay (Gymnorhinus cyanocephala)	A,B,C,D,E,F	C-P resident	Unknown	Pinion-juniper woodlands but ranges into sagebrus
! Clark's Nutcracker (Nucifraga columbiana)	A,B,C,E,F	C-P resident	Unknown	High mountains in conife near tree line. winters in lower elevations.

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Paridae				
Black-capped Chickadee (Parus atricapillus)	A,B,C,D,E,F	C-P resident	Unknown	In summer aspen-conifer, mixed woodlands and forest edges; in winter woodlands along valley streams and tree rows
Mountain Chickadee (Parus gambeli)	A,B,C,D,E,F	C-P resident	Unknown	In summer mountain forests and conifers; in winter riparian woodlands at lower elevation
Plain Titmouse (Parus inornatus)	A,B,C,D,E,F	K-P resident	Unknown	Pinion-juniper woodlands
Bushtit (Psaltriparus minimus)	A,B,C,D,E,F	C-P resident	Unknown	Oak woodlands, mountain brush, broad-leafed and mixed woods and pinion-juniper forest
Family Sittidae				
White-breasted Nuthatch (Sitta carolinensis)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, pinion-juniper woodlands, oak brush, and riparian woodlands
Red-breasted Nuthatch (Sitta canadensis)	A,B,C,E,F	C-P resident	Unknown	Coniferous forests
Pygmy Nuthatch (Sitta pusilla)	A,B,C,D,E,F	C-P resident	Unknown	Ponderosa pines and Douglas fir

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Certidae				
! Brown Creeper (Certhia familiaris)	A,B,C,E,F	C-P resident	Unknown	In summer mature montane mixed and coniferous forests; lower elevations in winter
Family Cinclidae				
Dipper (Cinclus mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Fast-flowing streams in or near mountains; lower levels in winter
Family Troglodytidae				
! House Wren (Troglodytes aedon)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands of mountains and valleys
! Rock Wren (Salpinctes obsoletus)	A,B,C,D,E,F	C-P resident	Unknown	Desert to high mountain areas with talus slopes and cliffs
! Canyon Wren (Catherpes mexicanus)	A,B,C,D,E,F	C-P resideht	Unknown	Rocky cliffs, crevices, and rock slides
! Bewick's Wren (Thryomanes bewickii)	A,B,C,D,E,F	C-P resident	Unknown	Under brush and pinion-juniper woodlands
Long-billed Marsh Wren (Cistothorus palustris)	A,B,C,D,E,F	L-P resident	Unknown	Cattail marshes
Family Mimidae				
Mockingbird (Mimus polyglottos)	A,B,C,D,E,F	U-P transient and summer resident	Unknown	Towns, farms, ranches, roadsides, brush and desert streamsides
Gray Catbird (Dumetella carolinensis)	A,B,C,D,E,F	U-P summer resident	Unknown	Undergrowth, brush or thickets along valley streams

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Brown Thrasher (*Toxostoma rufum*)	D,E,F	R-P resident	Unknown	Brushy places and thorny thickets
Bendire's Thrasher (*Toxostoma bendirei*)	F	R-P resident	Unknown	Desert scrub and farmlands
Sage Thrasher (*Oreoscoptes montanus*)	A,B,C,D,E,F	C-P resident	Unknown	Sagebrush, rabbit-brush, brushy slopes and mesas
Family Muscicapidae				
American Robin (*Turdus migratorius*)	A,B,C,D,E,F	C-P resident	Unknown	In summer towns, lawns, farmland, open forests, streamsides and any wooc habitat; in winter berry bearing trees
Varied Thrush (*Ixoreus naevius*)	E,F	O-P winter resident	Unknown	Deciduous and coniferou: forests usually near wat
Hermit Thrush (*Catharus guttatus*)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	In summer mixed woodlanc and open coniferous fore in winter woods, thicket and parks
Swainson's Thrush (*Catharus ustulatus*)	A,B,D	C-P summer resident	Unknown	Willow thickets, river woodlands, aspens, fores undergrowth and conifers
Veery (*Catharus fuscescens*)	A,B	U-P summer resident	Unknown	Streamside woodlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Bluebird (Sialia mexicana)	A,B,C,D,E,F	K-P summer resident	Unknown	Scattered trees, open conifers, forests and farms
Mountain Bluebird (Sialia currucoides)	A,B,C,D,E,F	K-P resident	Unknown	In summer open areas where mountain meadows and pastures are interspersed with loose stan or single coniferous trees; in winter lower elevations, often open areas with available perching sites
Townsend's Solitaire (Myadestes townsendi)	A,B,C,D,E,F	C-P resident	Unknown	In summer open confero forests in the mountain in winter canyons, brus slopes and junipers
Family Sylviidae				
Blue-gray Gnatcatcher (Polioptila caerulea)	A,B,C,D,E,F	C-P summer resident	Unknown	Open mixed woods, strea side thickets, mountain brush and pinion-junipe woodlands
Golden-crowned Kinglet (Regulus satrapa)	A,B,C,D,E,F	U-P resident	Unknown	In summer coniferous forests; in winter pini juniper and brush in lo elevations
Ruby-crowned Kinglet (Regulus calendula)	A,B,C,D,E,F	C-P resident	Unknown	In summer coniferous forests; in winter othe woodlands and thickets

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Motacillidae				
Water Pipet (Anthus spinoletta)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine zone; in migration and winter plains, bare fields, shores and irrigated fie
Family Bombycillidae				
Bohemian Waxwing (Bombycilla garrulus)	A,B,C,D,E,F	U-P winter resident	Unknown	Widespread and feeds on berries
Cedar Waxwing (Bombycilla cedrorum)	A,B,C,D,E,F	C-P winter resident	Unknown	Open woodlands, Russian olive and other fruiting trees or orchards
Family Laniidae				
Northern Shrike (Lanius excubitor)	A,B,C,D,E,F	U-P winter resident	Unknown	Semi-open country or open country with look-out posts
Loggerhead Shrike (Lanius ludovicianus)	A,B,C,D,E,F	C-P resident	Unknown	Deserts and other open country with lookout posts, wires, scattered trees and low scrub
Family Sturnidae				
Starling (Stuirnus vulgaris)	A,B,C,D,E,F	C-P resident	Unknown	Cities, fields, orchards and woodlands
Family Vireonidae				
Gray Vireo (Vireo vicinior)	D,E,F	U-P summer resident	Unknown	Brushy mountain slopes, scrub oak and junipers
Solitary Vireo (Vireo solitarius)	A,B,C,D,E,F	U-P summer resident	Unknown	Streamside woodlands, pinion-juniper and Ponderosa pine forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Warbling Vireo (*Vireo gilvus*)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous and mixed aspe woodlands near mountain and valley streams
Family Parulidae				
Orange-crowned Warbler (*Vermivora celata*)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Brushy woodland clearin; hillsides, aspens and mountain brush; in migration streamside woodlands
Nashville Warbler (*Vermivora ruficapilla*)	A,B,C,D,E,F	U-P transient	Unknown	Open mixed woods with undergrowth and at forest edges
Virginia's Warbler (*Vermivora virginiae*)	A,B,C,D,E,F	C-P summer resident	Unknown	Oak canyons, brushy slopes and pinion-juniper brushland
Lucy's Warbler (*Vermivora luciae*)	E,F	U-P summer resident	Unknown	Along desert streams in willows and cottonwoods
Yellow Warbler (*Dendroica petechia*)	A,B,C,D,E,F	C-P summer resident	Unknown	Willows, aspens, stream side trees and shrubs o town shade trees
* Grace's Warbler (*Dendroica graciae*)	E,F	U-P summer resident	Unknown	Ponderosa pine-oakbrush communities of the mountains
Magnolia Warbler (*Dendroica magnolia*)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Hermit Warbler (Dendroica occidentalis)	E,F	U-P summer resident and transient	Unknown	Coniferous forests; in migration other trees
Yellow-rumped Warbler (Dendroica coronata)	A,B,C,D,E,F	C-P summer resident	Unknown	In summer coniferous an mixed forests; in winte varied woods, river thickets, brush and gardens
Black-throated Gray Warbler (Dendroica nigrescens)	A,B,C,D,E,F	K-P summer resident	Unknown	In summer dry oak slope pinion-juniper woodland open mixed woods; in migration varied trees and brush
Townsend's Warbler (Dendroica townsendi)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests
Northern Waterthrush (Seiurus noveboracensis)	B,C,D,E,F	U-P transient	Unknown	Swampy or wet woods, streamsides and lake-shores; in migration thickets
MacGillivray's Warbler (Oporornis tolmiei)	A,B,C,D,E,F	C-P summer resident	Unknown	Low dense undergrowth and shady, damp thicket:
Yellowthroat (Geothylpis trichas)	A,B,C,D,E,F	L-P summer resident	Unknown	Cattail and bulrush marshes, willow thicket: and streamsides
Yellow-breasted Chat (Icteria virens)	A,B,C,D,E,F	C-P summer resident	Unknown	Dense brush along water courses, willow thickets and moist

Species	Biogeographic Area Inhabited	Status	Trend	Habitat Use Area
Wilson's Warbler (Wilsonia pusilla)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous shrubbery or thickets, streamside growth, willows and fir thickets in the mountain
American Redstart (Setophaga ruticilla)	A,B,C	U-P transient	Unknown	Open secondary deciduous woodlands and riparian woodlands
Family Ploceidae				
House Sparrow (Passer domesticus)	A,B,C,D,E,F	C-P resident	Unknown	Cities, farms and houses
Family Icteridae				
Western Meadowlark (Sturnella neglecta)	A,B,C,D,E,F	C-P resident	Unknown	Open fields, meadows and plains
Yellow-headed Blackbird (Xanthocephalus xanthocephalus)	A,B,C,D,E,F	C-P summer resident	Unknown	Marshes with cattail and bulrushes; forages in fields and open country
Red-winged Blackbird (Agelaius phoeniceus)	A,B,C,D,E,F	C-P resident	Unknown	Breeds in marshes with emergent aquatic vegetation, forages in cultivated land and at the edge of water
Northern Oriole (Icterus galbula)	A,B,C,D,E,F	C-P summer resident	Unknown	Open woodlands, cottonwoods or other shade trees and riparian areas

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
!* Scotts Oriole (Icterus parisorum)	C,D,E,F	U-P summer resident	Unknown	Pinion-juniper woodlands of desert mountains oak slopes and cottonwood trees in canyons
Rusty Blackbird (Euphagus carolinus)	A	O-P transient	Unknown	Wooded marshes and riparian woodlands
! Brewer's Blackbird (Euphagus cyanocephalus)	A,B,C,D,E,F	C-P resident	Unknown	Varied open country, lakeshores, irrigated pastures, feed lots, parks and cities
Common Grackle (Quiscalus quiscula)	A,B,D	A-P transient	Unknown	Farms, fields, streamsides and wet woodlands
Brown-headed Cowbird (Molothrus ater)	A,B,C,D,E,F	C-P resident	Unknown	Farms, fields, barnyards wood edges and riparian woodlands
Family Thraupidae				
! Western Tanager (Piranga ludoviciana)	A,B,C,D,E,F	C-P summer resident	Unknown	Open coniferous, aspen or mixed forests; widespread in migration
Family Embarizidae				
Rose-breasted Grosbeak (Pheucticus ludovicianus)	F	O-P summer resident	Unknown	Broadleaf riparian areas and aspens
! Black-headed Grosbeak (Pheucticus melanocephalus)	A,B,C,D,E,F	C-P summer resident	Unknown	Edges of second growth deciduous woods, pinion, riparian areas, orchards and parks

Blue Grosbeak (Guiraca caerulea)	B,C,D,E,F	C-P summer resident	Unknown	Brushy and weedy places willows and river thick and other riparian area
Lapland Longspur (Calcarius lapponicus)	A,B,C,D,E,F	R-P winter resident	Unknown	Fields, grasslands, saline flats, desert shrub; often seen with horned larks
Indigo Bunting (Passerina cyanea)	A,B,D	R-P summer resident	Unknown	Brush, farm lands and streamsides
! Lazuli Bunting (Passerina amoena)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain brush, stream-side shrubs and farmlan tree rows
! Green-tailed Towhee (Chlorura chlorura)	A,B,C,D,E,F	C-P summer resident	Unknown	Low mountain brush, greasewood and pinion-juniper woodlands
! Rufous-sided Towhee (Pipilo erythrophthalmus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain brush, forest edges and city shrubs
! Lark Bunting (Calamospiza melanocorys)	A,B,C,D,E,F	O-P transient	Unknown	Plains, prairies, deser shrub and sagebrush
Savannah Sparrow (Passercules sandwichensis)	A,B,C,D,E,F	C-P summer resident	Unknown	Grasslands, fields, saltgrass meadows and open country
* Grasshopper Sparrow (Ammodramus savannarum)	A,B,C,D,E,F	K-P transient	Unknown	Dry grasslands
LeConte's Sparrow (Ammospiza leconteii)	F	A-P transient	Unknown	Tall grass, weedy meadows and marshes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Vesper Sparrow (Pooecetes gramineus)	A,B,C,D,E,F	C-P summer resident	Unknown	Alfalfa and grain fields, meadows, sagebrush and desert shrub
Lark Sparrow (Chondestes grammacus)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country in sagebru and desert shrub with available perch sites
Sage Sparrow (Amphispiza belli)	A,B,C,D,E,F	U-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs
Dark-eyed Junco (Junco hyemalis)	A,B,C,D,E,F	C-P resident	Unknown	In summer openings and edges of coniferous and mixed woodlands; in wint greasewood and undergro
Gray-headed Junco (Junco caniceps)	A,B,C,D,E,F	C-P summer resident	Unknown	Coniferous, mixed forest and mountain brush
Tree Sparrow (Spizella arborea)	A,B,C,D,E,F	U-P winter resident	Unknown	Willow thickets and brushy areas
Chipping Sparrow (Spizella passerina)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain coniferous and deciduous woodlands, valley woodlands, farms, orchards, parks and brushlands
Brewer's Sparrow (Spizella breweri)	A,B,C,D,E,F	C-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs or brushy areas
Harris Sparrow (Zonotrichia querula)	A,B,C,D,E,F	U-P winter resident	Unknown	Brushy edges of open woodlands, Russian olives and willows

Species	Area Inhabited	Status	Trend	Habitat Use Area
White-crowned Sparrow (Zonotrichia leucophrys)	A,B,C,D,E,F	C-P resident	Unknown	In summer forest edges and clearings, low bru: and mountain thickets; winter widespread in tl valleys, along fence r willows, brushy areas, corn and greasewood
White-throated Sparrow (Zonotricia albicollis)	E,F	R-P winter resident	Unknown	Coniferous and mixed woodlands, woodland undergrowth thickets and brush
Golden-crowned Sparrow (Zonotrichia atricapilla)	E,F	R-P winter resident	Unknown	Mountain brush and brushy areas in the lower valleys
Swamp Sparrow (Zonotrichia georgiana)	F	U-P winter resident	Unknown	Marshes; in migration weedy fields
Fox Sparrow (Zonotrichia iliaca)	A,B,C	K-P summer resident and transient	Unknown	Valley and mountain woodlands and brushy areas usually near wat
Lincoln's Sparrow (Zonotrichia lincolnii)	A,B,C	U-P summer resident R-P winter resident	Unknown	In summer willow thickets, brushy bogs; in winter lowland thickets, tall weeds and bushes
Song Sparrow (Zonotrichia melodia)	A,B,C,D,E,F	C-P resident	Unknown	Woodland edges, grass-lands, cattail marshes thickets and brushy fence rows

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Black-throated Sparrow (Amphispiza bilineata)	A,B,C,D,E,F	U-P summer resident	Unknown	Pinion-juniper, mountair brush and sagebrush
Family Fringillidae				
! Evening Grosbeak (Coccothraustes vespertinus)	A,B,C,D,E,F	C-P winter resident	Unknown	Boxelders, Russian olive trees and fruiting shrut
! Cassin's Finch (Carpodacus cassinii)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Unknown	In summer, open conifer forests of high mountair in winter valleys
! House Finch (Carpodacus mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Varied habitats; towns, ranches, open woods, mountain scrub, canyons, deserts and riparian are
Pine Grosbeak (Pinicola enucleator)	A,B,C,E,F	U-P resident	Unknown	In summer coniferous forests; in winter mixed woods and fruiting trees
! Rosy Finch (Leucosticte arctoa)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine tundra, meadows and snowfields; winters in lowlands
Pine Siskin (Carduelis pinus)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, alor edges of second growth deciduous forests; in migration seen in large flocks in the lower vall

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! American Goldfinch (Carduelis tristis)	A,B,C,D,E,F	C-P resident	Unknown	Riparian woodlands, willows, cottonwoods, orchards, roadsides and sunflowers
Lesser Goldfinch (Carduelis psaltria)	A,B,C,D,E,F	C-P resident	Unknown	Open brushy country, open woods, wooded streams and gardens
Red Crossbill (Loxia curvirostra)	A,B,C,E,F	U-P summer resident	Unknown	Coniferous forests
Mammals -- 103 species in southeastern Utah				
Order Insectivora				
Family Soricidae				
* Dwarf Shrew (Sorex nanus)	B,C,D,E,F	L-N	Unknown	Open grass-covered areas which may have scattered brush, marshes coniferous forests and openings in woods
North Water Shrew (Sorex palustris)	A,B,C,E,F	C-N	Unknown	Along nearly all permanent streams in mountainous areas
! Merriam Shrew (Sorex merriami)	A,B,C,D,E,F	U-N	Unknown	Arid sagebrush or grassland areas, mountain mahogany, coniferous forests, aspe and cottonwoods
Vagrant Shrew (Sorex vagrans)	A,B,C,F	C-N	Unknown	Marshes, bogs, wet meadows and along streams in forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Masked Shrew (Sorex cinereus)	A,B,D,E	C-N	Unknown	Moist sites in forests, open country and brushla
! Dusky Shrew (Sorex obscurus)	A,B,C,F	C-N	Unknown	Marshes, coniferous forests and dry hillside.
* Gray (Desert) Shrew (Notiosorex crawfordi)	E,F	L-N	Unknown	Arid alluvial fans, brushy slopes, sagebrush and other low desert shrub communities
Order Chiroptera				
Family Vespertilionidae				
! Little Brown Myotis (Myotis lucifugus)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, hollow trees or building usually near water
! Fringed Myotis (Myotis thysanodes)	A,B,C,D,E,F	U-N	Unknown	Caves, old buildings, ro crevices, pinion-juniper and desert shrub
Long-eared Myotis (Myotis evotis)	A,B,C,D,E,F	C-N	Unknown	Coniferous forests in hi mountains, around buildi or trees and occasionall caves
! Long-legged Myotis (Myotis volans)	A,B,C,D,E,F	C-N	Unknown	Buildings, small pockets crevices in rock ledges and trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Yuma Myotis (Myotis yumanensis)	A,B,C,D,E,F	U-N	Unknown	Caves, tunnels and buildings in arid areas
! California Myotis (Myotis californicus)	A,B,C,D,E,F	C-N	Unknown	Mine tunnels, hollow trees, loose rocks, buildings, bridges; chiefly a crevice dweller (up to 6,000 feet in elevation)
! Small-footed Myotis (Myotis leibii)	A,B,C,D,E,F	U-N	Unknown	Caves, mine tunnels, crevices in rocks and in buildings
Silver-haired Bat (Lasionycteris noctivagans)	A,B,C,D,E,F	C-N	Unknown	Forest areas, occasional in caves or buildings
! Western Pipistrelle (Pipistrellus hesperus)	A,B,C,D,E,F	C-N	Unknown	Caves, under loose rocks crevices, in cliffs, buildings; arid areas ne water courses
! Big Brown Bat (Eptesicus fuscus)	A,B,C,D,E,F	C-N	Unknown	Caves, tunnels, crevices hollow trees, buildings and wooded areas
!* Red Bat (Lasiurus borealis)	A,B,C,D,E,F	I-N	Unknown	Wooded areas; roosts in trees and occasionally enters caves
! Hoary Bat (Lasiurus cinereus)	A,B,C,D,E,F	U-N	Unknown	Wooded areas
! Western Big-eared Bat (Plecotus townsendii)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels and buildings utilized for roosting; inhabits arid western desert shrub, pinion-juniper a[illegible]pine

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Mexican Big-eared Bat (Plectus phyllotis)	F	L-N	Unknown	Caves in pine-oak forest between 5,000 to 8,500 feet elevation
! *Spotted Bat (Euderma maculata)	Unknown	L-N	Unknown	Arid country; it occasionally enters buildings and caves
! Pallid Bat (Antrozous pallidus)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, crevices in rocks, buildings and trees are utilized for roosts; inhabits scattered desert shrub and pine-oak forest below 6,500 feet elevatic
Family Molossidae				
Mexican Free-tailed Bat (Tadarida brasiliensis)	A,B,C,D,E,F	C-N	Unknown	Caves and buildings are utilized for roosts; inhabits lower and upper Sonoran Life Zones
Order Lagomorpha				
Family Ochotonidae				
Pika (Ochontona princeps)	A,B,C,E,F	C-N	Unknown	Talus slopes and rock-slides above 8,000 feet elevation
Family Leporidae				
! White-tailed Jackrabbit (Lepus townsendii)	A,B,C,D	C-N	Stable	Open, grassy or sage-brush areas at medium elevation
*Snowshoe Hare (Lepus americanus)	A,B,C	L-P	Cyclic	Coniferous forests and aspen, riparian and brush types near conifers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Black-tailed Jackrabbit (*Lepus californicus*)	A,B,C,D,E,F	C-N	Stable	Open grassland, sagebru and desert shrub areas low to medium elevation
*Mountain Cottontail (*Sylvilagus nuttallii*)	A,B,C,E,F	C-P	Stable	Thickets, sagebrush, loose rocks, cliffs and forests
! *Desert Cottontail (*Sylvilagus audubonii*)	A,B,C,D,E,F	C-P	Stable	Open plains, foothills low valleys with grass, sagebrush or scattered pinion-juniper
Order Rodentia				
Family Sciuridae				
Zuni Prairie Dog (*Cynomys gunnisoni*)	F	C-N	Stable	Mountain valleys, 5,000-12,000 feet elevation; open to slightly brushy country with scattered pinion-juniper
White-tailed Prairie Dog (*Cynomys leucurus*)	A,B,C,D,E,F	C-N	Stable	Valleys and flatlands where vegetation is spar
*Abert Squirrel (*Sciurus aberti*)	F	L-P	Stable	Ponderosa pines
Red Squirrel (*Tamiasciurus hudsonicus*)	A,B,C,F	C-N	Stable	Coniferous forests in the mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Spotted Ground Squirrel (Spermophilus spilosoma)	F	L-N	Unknown	Open forests, scattered brush and grassy areas with sandy soil is preferred
! Rock Squirrel (Spermophilus variegatus)	A,B,C,D,E,F	C-N	Stable	Rocky canyons with boulder strewn slopes, riparian woodlands, and ditchbanks
Uintah Ground Squirrel (Spermophilus armatus)	A,B	C-N	Stable	Meadows and edges of fields near green vegetation up to 8,000 feet elevation
!Golden-mantled Ground Squirrel (Spermophilus lateralis)	A,B,C	C-N	Stable	Mountain brush, open pine and spruce-fir forests to above timberline
!Whitetail Antelope Squirrel (Ammospermophilus leucurus)	A,B,C,D,E,F	C-N	Stable	Arid areas of low desert and foothills with sparse vegetation
Yellow-bellied Marmot (Marmota flaviventris)	A,B,C,E,F	C-N	Stable	Rocky sites or talus slopes along valleys or in foothills 5,000 to 9,000 feet elevation
*Northern Flying Squirrel (Glaucomys sabrinus)	A,B,C,F	K-N	Unknown	Coniferous and mixed forests in high mountain

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Least Chipmunk (Eutamius minimus)	A,B,C,D,E,F	C-N	Stable	Variety of habitat types including sagebrush, desert shrub, mountain bush, coniferous and mixed forest areas
Colorado Chipmunk (Eutamius quadrivittatus)	C,E,F	C-N	Stable	Coniferous forests, mountain brush areas, rocky slopes and ridges
! Uintah Chipmunk (Eutamius umbrinus)	A,B,D,E,F	C-N	Stable	Coniferous forest and mountain brush areas up to timberline with rocky slopes
! Cliff Chipmunk (Eutamius dorsalis)	A,B,C,D,E	U-N	Stable	Pinion-juniper slopes, riparian woodlands with rocky areas
Family Geomyidae				
Northern Pocket Gopher (Thomomys talpoides)	A,B,C,D,E,F	C-N	Unknown	Grassy prairies, alpine meadows, brush areas, open pine forests; generally restricted to the mountains
! Valley or Botta Pocket Gopher (Thomomys bottae)	A,B,C,D,E,F	C-N	Unknown	Valleys and mountain meadows; prefers loam soil but may be found in sandy or rocky situations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Ord Kangaroo Rat (Dipodomys ordii)	A,B,C,D,E,F	C-N	Unknown	Desert shrub, pinion-juniper and tamarisk communities; sandy soils preferred but found on hard soils
Baird Pocket Mouse (Perognathus flavus)	F	C-N	Unknown	Prefers short grass areas with sandy or rocky soils
! Great Basin Pocket Mouse (Perognathus parvus)	A,D	C-N	Unknown	Sagebrush or greasewood and other desert shrub communities and pinion-juniper
Apache Pocket Mouse (Perognathus apache)	C,D,F	C-N	Unknown	Sparse brushlands and scattered pinion-juniper, usually 5,000-7,200 feet elevation
Family Castoridae				
* Beaver (Castor canadensis)	A,B,C,D,E,F	C-P	Increasing	Streams, lakes and irrigation systems with poplars, birch or willows on the bank
Family Cricetidae				
! Western Harvest Mouse (Reithrodontomys megalotis)	A,B,C,D,E,F	C-N	Unknown	Grasslands, open desert, wetlands, irrigated farmland of dense vegetation near water
! Canyon Mouse (Peromyscus crinitus)	A,B,C,D,E,F	C-N	Unknown	Rocky canyons and slopes with mountain brush

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Deer Mouse (Peromyscus maniculatus)	A,B,C,D,E,F	C-N	Unknown	All dry-land habitat and irrigated farmland within its range
! Brush Mouse (Peromyscus boylei)	A,B,C,D,E,F	C-N	Unknown	Brushy areas of arid and semi-arid regions; prefer rocky sites
! Pinion Mouse (Peromyscus truei)	A,B,C,D,E,F	C-N	Unknown	Rocky terrain in pinion-juniper areas
Northern Grasshopper Mouse (Onychomys leucogaster)	C,F	U-N	Unknown	Open country of grass, sagebrush or greasewood and sandy or gravelly so
*White-throated Wood Rat (Neotoma albigula)	F	K-N	Unknown	Brushland with rocky cliffs and shallow caves
! Desert Wood Rat (Neotoma lepida)	A,B,C,D,E	C-N	Unknown	Desert floors and rocky slopes with low desert vegetation or arid mountain brush
*Mexican Wood Rat (Neotoma mexicana)	F	K-N	Unknown	Rocks, cliffs and mountains
Bushy-tailed Wood Rat (Neotoma cinerea)	A,B,C,D,E,F	C-N	Unknown	High mountains with rimrock, rock slides and pines
Muskrat (Ondatra zibethicus)	A,B,C,D,E,F	C-N	Stable	Marshes, edge of ponds, lakes, streams and irrigation canals

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Meadow Vole (Microtus pennsylvanious)	A,D	C-N	Unknown	Moist areas with dense growth of grasses
! Mountain Vole (Microtus montanus)	A,B,D,E	C-N	Unknown	Dense vegetation in sagebrush-grass communities
Richardson's Vole (Microtus richardsoni)	A	C-N	Unknown	Creekbanks and marshes in mountains to above timberline
! Longtail Vole (Microtus longicaudus)	A,B,C,D,E,F	C-N	Unknown	In summer streambanks, mountain meadows with dry sites; in winter brushy areas
Sagebrush Vole (Lagurus curtatus)	C,F	C-N	Unknown	Scattered sagebrush with loose soil and arid conditions
Family Muridae				
! Black Rat (Rattus rattus)	A,B,C,D,E,F	C-N	Unknown	Buildings and dumps
! Norway Rat (Rattus norvegicus)	A,B,C,D,E,F	C-N	Unknown	Burrows along building foundations and beneath rubbish piles
! House Mouse (Mus musculus)	A,B,C,D,E,F	C-N	Unknown	Buildings and occasionally in fields

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Zapodidae				
! Western Jumping Mouse (*Zapus princeps*)	A	C-N	Unknown	Low meadows near streams with lush growth of grasses and forbs; found in various land habitats
Family Erethizontidae				
! Porcupine (*Erethizon dorsatum*)	A,B,C,D,E,F	C-N	Stable	Forested areas, occasionally away from trees if brush is available
Order Carnivora				
Family Canidae				
! Coyote (*Canis latrans*)	A,B,C,D,E,F	C-N	Stable	Ubiquitous
! * Red Fox (*Vulpes fulva*)	A,B,C,D,E,F	K-N	Unknown	Forest and open country preferred
* Kit Fox (*Vulpes macrotis*)	A,B,C,D,E,F	K-N	Unknown	Open level, sandy ground preferred with low desert vegetation
! Gray Fox (*Urocyan cinereoargenteus*)	A,B,C,D,E,F	C-N	Stable	Brush and open forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Gray Wolf (Canis lupus)	A,B,C,D,E,F	E-P	Decreasing	Wilderness forests
Family Ursidae				
*Black Bear (Ursus americanus)	A,B,C,E,F	C-P	Increasing	Mountainous areas
*Grizzly Bear (Ursus horribilis)	A,B,C,E,F	X-P	Extirpated	Remote mountainous regions
Family Procyonidae				
Ring-tailed Cat (Bassariscus astutus)	A,B,C,D,E,F	C-N	Stable	Near water on slopes with mountain brush, rocky ridges and cliffs
*Raccoon (Procyon lotor)	A,B,C,D,E,F	K-N	Unknown	Along streams, lake borders and near wooded areas or rock cliffs
Family Mustelidae				
*Short-tailed Weasel (Mustela erminea)	A,B,C,F	K-P	Unknown	Brushy or wooded areas not far from water
*Long-tailed Weasel (Mustela frenata)	A,B,C,D,E,F	C-P	Stable	All land habitat types near water
*Mink (Mustela vison)	A,B,C,F	L-P	Unknown	Along streams and lakes
*Wolverine (Gulo luscus)	A,B	L-P	Unknown	Remote mountain regions
*Black-footed Ferret (Mustela nigripes)	A,B,C,D,F	E-P	Unknown	Prairie dog towns
*Marten (Martes caurina)	A,B,C,F	R-P	Unknown	Coniferous forests at high elevations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
!* Badger (Taxidea taxus)	A,B,C,D,E,F	C-P	Stable	Open grasslands, deserts and high mountain forests where prey is available
!* Striped Skunk (Mephitis mephitis)	A,B,C,D,E,F	C-P	Increasing	Semi-open country of prairie, brushlands or mixed woodlands within two miles of water
!* Spotted Skunk (Spilogale gracilis)	A,B,C,D,E,F	C-P	Stable	Prairies or grasslands with brushy or sparsely wooded areas along streams with boulders
* River Otter (Lutra canadensis)	A,B,C,D,E,F	L-P	Unknown	Along streams and lake borders
Family Felidae				
!* Bobcat (Lynx rufus)	A,B,C,D,E,F	L-P	Unknown	Rimrock and mountain brush areas
* Canada Lynx (Lynx canadensis)	A,B,C,E,F	L-P	Unknown	Forested areas in the mountains
!* Cougar (Felis concolor)	A,B,C,D,E,F	C-P	Stable	Rugged mountains with forests, cliffs and ledges
Order Artiodactyla				
Family Cervidae				
!* Mule Deer (Odocoileus hemionus)	A,B,C,D,E,F	C-P	Increasing	Coniferous forests, desert shrub, mountain brush, grassland with shrubs and other habitats where brows species are present

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Moose (Alces alces)	A	L-P	Increasing	Mountainous areas, forests, mountain brush and willow bottoms
!* Rocky Mountain Elk (Cervus canadensis)	A,B,C,E,F	C-P	Increasing	Semi-open forests, mountain meadows (in summer), foothills, plains and valleys
Family Antilocapridae				
* Pronghorn Antelope (Antilocapra americana)	B,C,D,E,F	L-P	Stable	Open prairies and sagebrush or desert shrub plains
Family Bovidae				
* Desert Bighorn Sheep (Ovis canadensis nelsoni)	D,E,F	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
* Rocky Mountain Bighorn Sheep (Ovis canadensis canadensis)	B,C	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
* Bison (Bison bison)	E	L-P	Stable	Desert shrub plains of the Burr Desert and mountain brush forest habitats associated wit steep mountain slopes o the Henry Mountains

List of Game Species and Region of Introduction within Utah.

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
10 BIG GAME SPECIES					
Bison	x	x			
Black Bear	x	x	x	x	x
Cougar	x	x	x	x	x
Desert Bighorn Sheep	x	x			
Elk	x	x	x	x	x
Moose	x		x	x	x
Mountain Bighorn Sheep	x		x	x	x
Mountain Goat			x		
Mule Deer	x	x	x	x	x
Pronghorn Antelope	x	x	x	x	x
Subtotal	9	7	8	7	7
20 GAME FISH SPECIES					
Arctic Grayling		x		x	x
Black Bullhead	x	x	x	x	x
Black Crappie	x	x	x	x	x
Bluegill	x	x	x	x	x
Bonneville Cisco					x
Brook Trout	x	x	x	x	x
Brown Trout	x	x	x	x	x
Channel Catfish	x	x	x	x	x
Cutthroat Trout	x	x	x	x	x
Golden Trout			x	x	
Kokanee Salmon				x	x
Lake Trout		x	x	x	x
Largemouth Bass	x	x	x	x	x
Mountain Whitefish			x	x	x
Northern Pike	x	x			
Perch	x	x	x	x	x
Rainbow & Albino Trout	x	x	x	x	x
Smallmouth Bass			x	x	x
Striped Bass	x	x			
Walleye	x	x	x	x	x
White Bass		x	x		
Subtotal	13	16	16	17	17

Game Species of Utah	Region: Southeastern	Southern	Central	Northeastern	Northern
9 FURBEARER SPECIES					
Badger	x	x	x	x	x
Beaver	x	x	x	x	x
Long-tailed Weasel	x	x	x	x	x
Marten	x	x	x	x	x
Mink	x	x	x	x	x
River Otter	x			x	x
Short-tailed weasel	x	x	x	x	x
Spotted Skunk	x	x	x	x	x
Striped Skunk	x	x	x	x	x
Subtotal	9	8	8	9	9
43 MIGRATORY GAME BIRD SPECIES					
American Widgeon	x	x	x	x	x
Band-tailed Pigeon	x	x	x		
Barrows Goldeneye	x	x	x	x	x
Black Brant		x			x
Black Duck		x	x		x
Blue-winged Teal	x	x	x	x	x
Bufflehead	x	x	x	x	x
Canada Goose	x	x	x	x	x
Canvasback	x	x	x	x	x
Cinnamon Teal	x	x	x	x	x
American Coot	x	x	x	x	x
Common Gallinule	x	x	x		x
Common Goldeneye	x	x	x	x	x
Common Merganser	x	x	x	x	x
Common Snipe	x	x	x	x	x
European Widgeon			x		x
Fulvous Tree Duck		x			x
Gadwall	x	x	x	x	x
Greater Scaup	x	x	x	x	x
Green-winged Teal	x	x	x	x	x
Harlequin Duck					x

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
Hooded Merganser	x	x	x	x	x
Lesser Scaup	x	x	x	x	x
Mallard	x	x	x	x	x
Mourning Dove	x	x	x	x	x
Old Squaw		x	x		x
Pintail	x	x	x	x	x
Red-breasted Merganser	x	x	x	x	x
Redhead	x	x	x	x	x
Ring-necked Duck	x	x	x	x	x
Ross Goose	x	x			x
Ruddy Duck	x	x	x	x	x
Sandhill Crane	x	x	x	x	x
Shoveler	x	x	x	x	x
Snow Goose	x	x	x	x	x
Sora Rail	x	x	x	x	x
Surf Scoter			x		x
Trumpeter Swan		x	x		x
Virginia Rail	x	x	x	x	x
Whistling Swan	x	x	x	x	x
White-fronted Goose	x	x	x	x	x
White-winged Scoter	x	x	x		x
Wood Duck	x	x	x	x	x
Subtotal	35	40	39	31	42

5 SMALL GAME-MAMMAL SPECIES

Abert Squirrel	x				
Desert Cottontail	x	x	x	x	
Mountain cottontail	x	x	x	x	x
Pigmy Cottontail		x	x		x
Snowshoe Hare	x	x	x	x	x
Subtotal	4	4	4	3	3

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
12 SMALL GAME-UPLAND BIRD SPECIES					
Blue Grouse	x	x	x	x	x
California Quail	x	x	x	x	x
Chukar	x	x	x	x	x
Gambels Quail	x	x			
Hungarian Partridge			x		x
Merriam's Turkey	x	x			
Ring-necked Pheasant	x	x	x	x	x
Ruffed Grouse	x	x	x	x	x
Sage Grouse	x	x	x	x	x
Sharp-tailed Grouse					x
White-tailed Ptarmigan				x	x
White-winged Pheasant	x	x			
Subtotal	9	9	7	7	9
100 Total Game Species in Utah	78	83	81	73	86

Table 2. Classification of the 466 species of vertebrate wildlife that inhabit six biogeographic areas within Southeastern Utah.

	Biogeographic Areas[1]					
	A	B	C	D	E	F
FISH	14	20	15	15	24	31
Protected-Threatened	(0)	(1)	(1)	(1)	(1)	(1)
Protected-Endangered	(0)	(3)	(2)	(1)	(1)	(2)
Protected-Nongame	(10)	(11)	(9)	(10)	(12)	(16)
Protected-Game	(4)	(5)	(3)	(3)	(10)	(12)
AMPHIBIANS	6	5	6	7	7	10
Protected-Nongame	(1)	(1)	(1)	(1)	(1)	(2)
Unprotected-Nongame	(5)	(4)	(5)	(6)	(6)	(8)
REPTILES	18	14	15	14	21	28
Unprotected-Nongame	(18)	(14)	(15)	(14)	(21)	(28)
BIRDS	242	244	242	235	251	262
Protected-Extirpated	(1)	(1)	(1)	(1)	(1)	(1)
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(2)	(2)	(2)	(2)	(2)	(2)
Protected-Nongame	(199)	(202)	(202)	(193)	(208)	(217)
Protected-Game	(39)	(38)	(36)	(38)	(39)	(41)
Unprotected-Nongame	(1)	(1)	(1)	(1)	(1)	(1)
MAMMALS	84	80	80	65	66	90
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(1)	(1)	(1)	(1)	(0)	(1)
Protected-Extirpated	(2)	(2)	(2)	(0)	(2)	(2)
Protected-Game	(18)	(19)	(19)	(12)	(16)	(19)
Unprotected-Extirpated	(0)	(0)	(0)	(0)	(0)	(0)
Unprotected-Nongame	(63)	(58)	(58)	(52)	(53)	(62)
Total Protected Species	277	286	279	263	293	317
TOTAL:	364	363	358	336	369	421

[1] Biogeographic areas of southeastern Utah
A- Wasatch Plateau east of Skyline Drive
B- West Tavaputs Plateau
C- East Tavaputs Plateau
D- San Rafael Swell and Desert
E- Henry Mountains and Burr Desert
F- Mountains and Deserts south of I-70 in Grand and San Juan counties

VERTEBRATE SPECIES OF WILDLIFE HAVING HIGH INTEREST TO THE STATE OF UTAH

Class of Animal	Number of species			
	Statewide[1]	SER[2]	Gordon Creek Wildlife Management Area	Chinook Coal Loadout Area
Fish	33	20	0	0
Amphbians	3	2	1	0
Reptiles	10	4	2	2
Birds	104	95	27	20
Mammals	61	40	15	12
TOTAL	211	161	45	34

1. Utah Division of Wildlife Resources as the state of Utah's wildlife authority recognizes 211 species of vertebrate wildlife that inhabit the state as being of high interest. High interest wildlife represent all game species and all species having significant economic importance from either a comsumptive or nonconsumptive perspective or special asthetic, scientific or educational values. This list includes all federally listed threatened or endangered species of wildlife.

2. Evaluation of data presented in Utah Division of Wildlife Resources publication No. 78-15, " Species List of Vertebrate Wildlife That Inhabit Southeastern Utah" shows that 161 of the 211 species of the states high interest wildlife inhabit the Southeastern Region (SER) of the state on occasion or during different seasons of the year.

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Appendix 3-L

Wildlife Survey Information

Raptor Surveys

A survey of the Co-Op Mine properties was made in cooperation with the Utah Division of Wildlife Resources (UDWR) in the spring of 1987. The results were submitted to DOGM along with a request to suspend future raptor surveys until such time that a survey was warranted. This request was based on Appendix R-1, correspondence from UDWR and R-2, DOGM Guidelines for Raptor Surveys. Suspension was granted, with exception of clearance surveys warranted by new disturbances, in April 1988 (See letter Appendix R-2.

In 1990 DOGM requested that a raptor survey be conducted to ensure that no disturbance or threats to nesting raptors existed in the area of proposed portals in the middle seam at Blind Canyon. A survey was conducted by Environmental Industries Services (E.I.S.), in June 1990, and a copy of the letter discussing the survey can be found in this Appendix following Appendix R-2.

Co-Op will conduct a raptor survey every ~~five~~ years~~ or when warranted due to new disturbance or proposed disturbance~~. The result of the survey will be maintained at the mine site for public view.

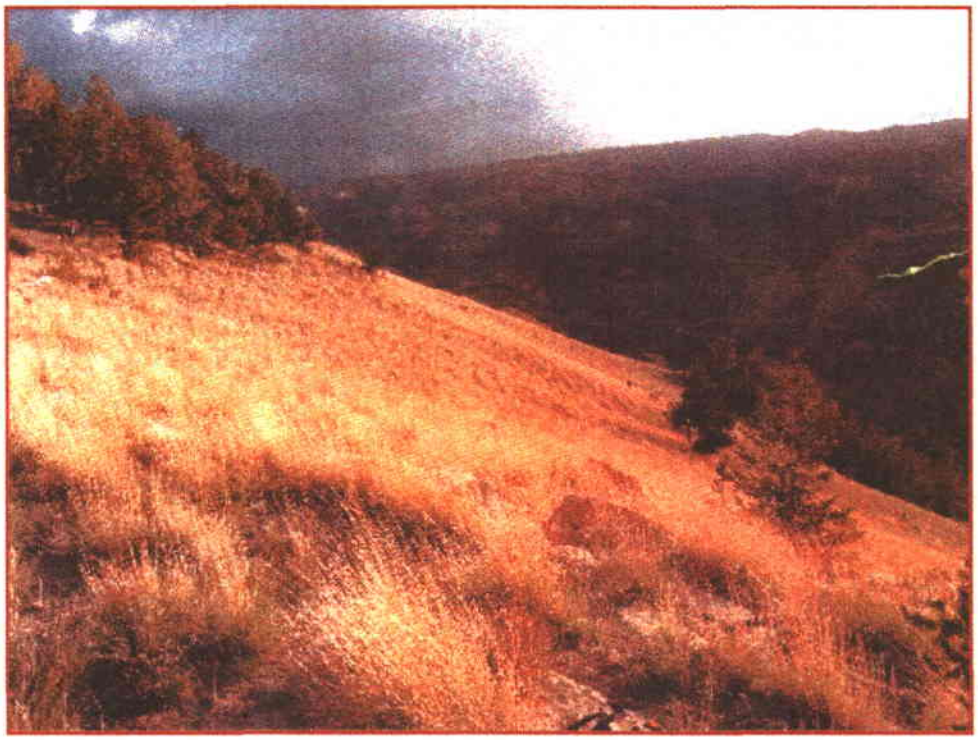
Raptor surveys were conducted in conjunction with UDWR in 1998, 1991, 2000, 2001, ~~and~~ 2002, 2004, and 2006 due to the addition of new areas~~the WHR area~~. The results of these survey can be found in Table 10D-1. A map showing the location of the nests can be obtained from UDWR and is included in the confidential MRP as Plate 5-3A..

Table 3L-1 Raptor Information

Nest No.	Species	Type	2006	2005	2004	2003	2002	2001	2000	1999	1998
76	Golden Eagle	Cliff	Inactive	Inactive	Inactive	Inactive	Tended	Tended	Dilapidatedidat	Not Surveyed	Inactive
83	Falcon	Cliff	Not Found	Not Found	not found	Inactive	Inactive	Inactive	Not Surveyed	Not Found	Tended
120	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Not Surveyed	Not Surveyed	Inactive
121	Prairie Falcon	Cliff	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Activetive	Not Surveyed	Not Surveyed	Activetive
122	Golden Eagle	Cliff	Dilapidated	Inactive	Inactive	Not Found	Inactive	Not Surveyed	Not Surveyed	Not Surveyed	Tended
126	Golden Eagle	Cliff	Inactive	Inactive	Inactive	Dilapidatedidat	Inactive	Inactive	Inactive	Not Surveyed	inactive
127	Falcon	Cliff	Not Found	Inactive	Inactive	Inactive	Inactive	Inactive	Not Found	Not Surveyed	Tended
817	Red-tailed Hawk	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Not Found	Inactive	NA
818	Red-tailed Hawk	Cliff	Inactive	Not Surveyed	not found	not surveyed	Dilapidatedidat	Inactive	Not Found	Inactive	NA
819	Golden Eagle	Cliff	Not Surveyed	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	Activetive	NA
839	Red-tailed Hawk	Cliff	Not Surveyed	Not Surveyed	not surveyed	Not Found	Inactive	Not Surveyed	Not Surveyed	Inactive	NA
840	Raven	Cliff	Not Surveyed	Not Found	not surveyed	Activetive	Not Found	Not Surveyed	Not Surveyed	Inactive	NA
901	Golden Eagle	Cliff	Not Surveyed	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA
902	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Dilapidatedidat	Dilapidatedidat	NA	NA
903	Golden Eagle	Cliff	Not Found	Not Surveyed	Inactive	Not Found	Not Found	Inactive	Inactive	NA	NA
904	Golden Eagle	Cliff	Tended	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Not Found	NA	NA
905	Golden Eagle	Cliff	Inactive	Inactive	Inactive	Inactive	Inactive	Dilapidatedidat	Dilapidatedidat	NA	NA
907	Golden Eagle	Cliff	Not Found	Not Surveyed	not found	Not Found	Inactive	Not Found	Not Found	NA	NA
909	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA
910	Golden Eagle	Cliff	Not Surveyed	Not Surveyed	Inactive	Inactive	Inactive	Dilapidatedidat	Dilapidatedidat	NA	NA
911	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA
912	Golden Eagle	Cliff	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	Activetive	NA	NA
913	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Dilapidatedidat	NA	NA
914	Golden Eagle	Cliff	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Not Found	NA	NA
915	Golden Eagle	Cliff	Active	Inactive	Inactive	Tended	Inactive	Tended	Inactive	NA	NA
916	Raven	Cliff	Not Found	Not Surveyed	not surveyed	Inactive	Inactive	Inactive	Activetive	NA	NA
917	Raven	Cliff	Not Surveyed	Not Surveyed	not surveyed	Inactive	Not Found	Inactive	Activetive	NA	NA
918	Golden Eagle	Cliff	Inactive	Not Surveyed	not surveyed	not surveyed	Inactive	Not Found	Inactive	NA	NA
919	Golden Eagle	Cliff	Not Surveyed	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
920	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
921	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Dilapidatedidat	Inactive	Inactive	NA	NA
925	Red-tailed Hawk	Cliff	Not Found	Not Surveyed	not found	not surveyed	Not Found	Not Found	Inactive	NA	NA
926	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
927	Golden Eagle	Cliff	Not Found	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
928	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
929	Golden Eagle	Cliff	Inactive	Not Surveyed	Dilapidated	not surveyed	Inactive	Inactive	Dilapidatedidat	NA	NA
931	Red-tailed Hawk	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Activetive	NA	NA
932	Golden Eagle	Cliff	Tended	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA
933	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA
934	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	not found	Inactive	Inactive	inactive	NA	NA
935	Golden Eagle	Cliff	Inactive	Inactive	Inactive	not surveyed	Inactive	Inactive	Inactive	NA	NA
944	Golden Eagle	Cliff	Dilapidated	Inactive	Inactive	Inactive	Inactive	Inactive	Activetive	NA	NA
945	Golden Eagle	Cliff	Not Surveyed	Inactive	Tended	Activetive	Inactive	Tended	Inactive	NA	NA
964	Golden Eagle	Cliff	Inactive	Inactive	not surveyed	Inactive	Inactive	Inactive	Activetive	NA	NA
965	Golden Eagle	Cliff	Active	Tended	Inactive	Tended	Tended	Tended	Inactive	NA	NA
1192	Golden Eagle	Cliff	Not Surveyed	Inactive	Inactive	Tended	Inactive	Inactive	NA	NA	NA
1197	Red-tailed Hawk	Cliff	Inactive	Not Surveyed	not surveyed	not surveyed	Inactive	Inactive	NA	NA	NA
1198	Red-tailed Hawk	Cliff	Inactive	Not Surveyed	Inactive	not surveyed	Inactive	Activetive	NA	NA	NA
1199	Golden Eagle	Cliff	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	NA	NA	NA
1325	Golden Eagle	Cliff	Inactive	Inactive	not found	Inactive	NA	NA	NA	NA	NA
1400	Raven	Cliff	Not Found	Not Surveyed	not surveyed	Inactive	NA	NA	NA	NA	NA
1401	Golden Eagle	Cliff	Not Surveyed	Inactive	Dilapidated	Inactive	NA	NA	NA	NA	NA
1459	Golden Eagle	Cliff	Inactive	Not Surveyed	Inactive	NA	NA	NA	NA	NA	NA
1468	Unknown	Cliff	Not Surveyed	Inactive							
1571	Golden Eagle	Cliff	Inactive								
1572	Golden Eagle	Cliff	Inactive								
1573	Golden Eagle	Cliff	Active								
1593	Red-tailed Hawk	Cliff	Inactive								

Confidential

Bat and Flammulated Owl Survey Report C. W. Mining Company Bear Canyon Mine



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Introduction

On the nights of 18 and 19 May, and 31 May and 1 June 2004, JBR Environmental Consultants inc. (JBR) conducted bat and flammulated owl (*Otus flammeolus*) surveys in the Wild Horse Ridge area near the Bear Creek Canyon Mine, Carbon County, Utah (Figures 1 and 2). These surveys were conducted as required under an existing Utah Division of Oil, Gas, and Mining permit, due to the potential for subsidence in the area as a result of activities at C.W. Mining Companies mine operation.

Inventory Area

The Inventory Area lies at 7,200 – 9,300 feet elevation and is comprised of 4 general vegetation communities (Figure 3): (1) a cliff/rock habitat that is dominated by mountain mahogany (*Cercocarpus ledifolius*), Juniper (*Juniperus spp.*), and barren rocky outcrops; (2) an open sagebrush (*Artemisia spp.*)/grass community; (3) a community characterized by grassy (*Agropyron smithii*) slopes on ridge tops; and a (4) coniferous forest co-dominated by bristlecone pine (*Pinus aristata*) and Douglas-fir (*Pseudotsuga menziesii*). Other species found in the coniferous forest community include juniper (*Juniperus spp.*), common juniper (*Juniperus communis*), limber pine (*Pinus flexilis*), mountain mahogany, gooseberry (*Ribes spp.*), aspen (*Populus tremuloides*), white fir (*Abies concolor*), and includes a small area containing mature ponderosa pine (*Pinus ponderosa*).

As a function of the vast expanses of rock outcrops and associated fissures and cracks, and plentiful snag habitat, the Inventory Area contains a virtually unlimited potential for day and night bat roosting sites. No known caves, open mine shafts, adits, or other man made structures that might provide additional habitat is known to exist in the Inventory Area. Perhaps the only habitat feature limiting bat presence within the Inventory Area is the availability of water for drinking and foraging. The only known standing water in the Inventory Area is a series of seeps/ponds located at flammulated owl calling station #1 (Figure 2).

As summarized in Rodriguez (2002), flammulated owls show a preference for mature pine and mixed conifer habitat types, and are obligate secondary cavity nesters that rely on previously excavated cavities in large diseased or dead trees for nest habitat.

The Inventory Area provides these types of habitats, and therefore provides potential habitat for the flammulated owl.

Methodology

JBR used an ANABAT II Bat Detector and an ANABAT CF Storage Zero Crossing Analysis Interface Module (ZCAIM) manufactured by Titley Electronics, Ltd., Ballina, NSW, Australia. JBR biologists ran the ANABAT at each of the 6 flammulated owl stations and at occasional strategic points between stations for 5-15 minutes at each station. Bat surveys were preformed at stations 1, 2, and 5 on 18 and 31 May, and at stations 1, 2, 3, 4, and 6 on 19 May and 1 June. Surveys were performed between 9:00 and 11:30 pm.

In addition to the above surveys, the ANABAT was also situated at station #1 from 19 to 30 May. When left unattended the bat detector and ZCAIM were enclosed in a weatherproof container. The bat detector's ultrasound transducer was positioned at a 45-degree angle to an acrylic reflector plate. This arrangement allowed the transducer to remain dry while recording bat calls unattended. Bat calls were recorded automatically; the equipment was programmed to turn on at 9:00 pm and to turn off at 6:00 am.

The ANABAT system records bat echolocation calls and stores them as digital format computer files. The file names specify the date and time the files were recorded. The recorded files were analyzed on a desktop computer using Analook software version 4.9g. The call identification process consists of visually comparing time-frequency displays of recorded call sequences against reference files (provided with the ANABAT system), which were recorded from known species that were hand released under controlled conditions. The analysis is somewhat subjective because it depends on making a visual comparison. The training and experience of the biologist doing the analysis is also important. At present there is no objective, standardized procedure that can be used to analyze and identify the recorded calls. For this reason, JBR will provide upon request the recorded files so that they may be archived for future reference or analyzed by other biologists experienced with the ANABAT hardware and software.

The ability of the ANABAT system to detect bat calls depends on factors such as the bat species, the call frequency, air temperature, relative humidity, distance from the

bat, and orientation of the detector's transducer. Bat activity at a given location is known to be highly variable, both from one night to the next and at different times during the night. Because JBR recorded bat calls on 15 evenings in different locations on the Inventory Area, the recordings should be a good representation of bat activity at the site.

The main purpose of the bat investigation was to detect the presence of Townsend's big-eared bats (*Corynorhinus townsendii*) and spotted bats (*Euderma maculatum*); therefore, JBR's analysis of the bat call files focused on these two species. Spotted bat calls are easily recognized because they are generally between 7 and 12 kHz, much lower than most other species (and within the range of human hearing). Townsend's bat calls are not quite as distinctive but they have one character that allows them to be identified with some confidence. Although bat calls normally consist of a fundamental frequency and one or more harmonics, the ANABAT system records only the most dominant frequency component. In Townsend's bat calls, the dominant frequency often switches between the fundamental and second harmonic, a character not usually observed in other species' calls.

Vocalization surveys for flammulated owls were conducted to USFS protocol by playing a CD recording of a male flammulated owl's territorial call over a megaphone. The call was played for two 30-second bouts, each separated by a 2-minute pause, during which time biologists looked and listened for responses. The process was repeated throughout the course of the field visit at all 6 calling stations in the Inventory Area. Surveys were conducted for flammulated owls at stations 1, 2, and 5 on 18 and 31 May, and at stations 1, 2, 3, 4, and 6 on 19 May and 1 June (Figure 2). All surveys were conducted after sunset between the hours of 9:00 and 11:30 pm.

While a detailed survey was not required for bristlecone pine, JBR biologists documented the general occurrence of this species while on site conducting other required surveys.

Results

During the 15 days of recording bat calls, 778 bat call files were produced. Of these, 356 files contained only noise or had too few calls to be useful for identification. These files were excluded from analysis. Each of the 422 remaining call files were examined for the presence of spotted bat calls, and then another pass through all the files was made to look for Townsend's big eared calls. No calls of either species were detected. JBR did not attempt to identify all bat calls that were recorded, because that was not the purpose of this investigation. However, it appears that most of the recorded bat calls were *Myotis* species (See Table 1).

Table 1. ANABAT results and their status in Utah

Species	Abundance In Utah[1]	Classification In Utah[2]
Eptesicus fuscus (Big Brown Bat)	Abundant	
Lasionycteris noctivagans (Silver-haired Bat)	Common	
Myotis ciliolabrum (Small-footed Myotis)	Uncommon	
Myotis volans (Long-legged Myotis)	Abundant	
Myotis thysanodes (Fringed Myotis)	Uncommon	Species of Concern

1. Oliver, G. V. 2000. The bats of Utah, a literature review. Utah Division of Wildlife Resources Publication Number 00-14.
2. Utah Division of Wildlife Resources Sensitive Species List. 18 December 2003.

No flammulated owls were observed or heard by JBR Biologists during the course of the field visits. A great horned owl (*Bubo virginianus*) was heard on 1 June from the biologist's campsite located near station 2. Incidentally, a pair of golden eagles (*Aquila chrysaetos*) were also observed on 18 May souring above the Inventory Area.

Concerning bristlecone pine, it and Douglas-fir are co-dominant species within the upper elevations of the conifer forest vegetation community (Figure 3). This species is relatively abundant and occurs at varying sizes and age classes, and the local population generally appears healthy.

Summary

The Wild Horse Ridge area provides habitat for and is used by numerous bat species. A minimum of 5 different bat species were identified within the Inventory Area. All 5 bat species are previously known to occur within Utah and none of the species are protected under the Endangered Species Act. Because of their limited distribution and/or declining populations in the state, one species (fringed myotis) of bat detected is considered a species of special concern by the Utah Division of Wildlife Resources. The Inventory Area also provides potential habitat for flammulated owls, although none were detected. Concerning bristlecone pine, this species is a co-dominant species within the upper elevations of the conifer forest vegetation community.

References

Rodriquez, R. Contributors: P. Summers, J. Schoppe, L. Young, and J. Stenten. 2002. Life history and analysis of endangered, threatened, candidate, sensitive, and management indicator species of Dixie National Forest. Version 2. Dixie National Forest, US Forest Service.

Figure 1. Inventory area.

Base: Hiawatha, Utah - 1:24,000 (USGS)
T16S R08W Sections 19 and 30
T16S R07W Sections 24 and 25

Inventory Area

1:250,000

0 2.5 5 10 15 Miles

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Created: 14 June 2004
Edited: Version 1
Printed: 14 June 2004

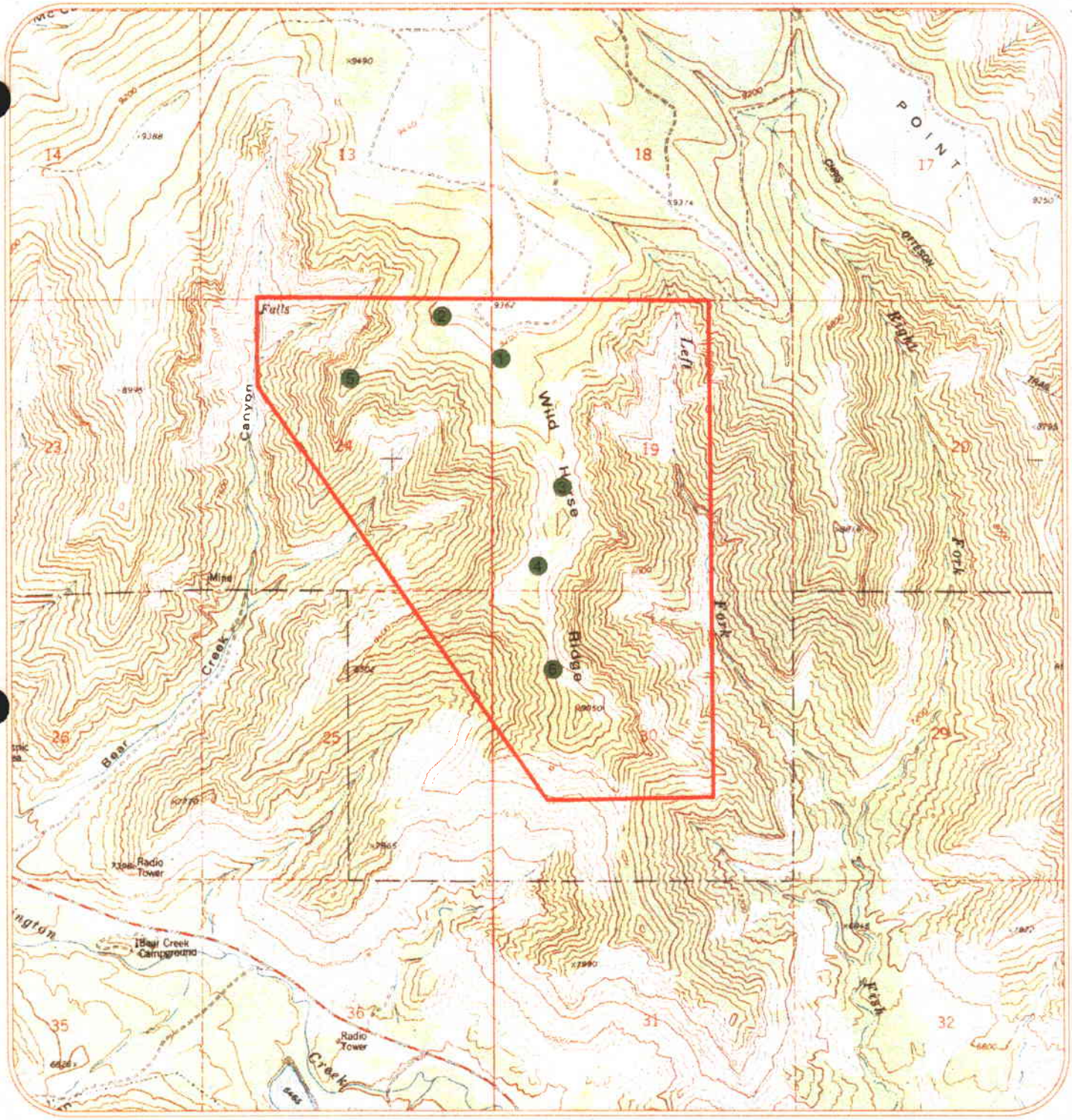

Figure 2. Flammulated owl calling stations.

Base: Hiawatha, Utah - 1:24,000 (USGS)
T16S R08W Sections 19 and 30
T16S R07W Sections 24 and 25

Inventory Area

Calling Stations

1:30,000

0 0.25 0.5 1 1.5 Miles

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Created: 14 June 2004
Edited: Version 1
Printed: 14 June 2004

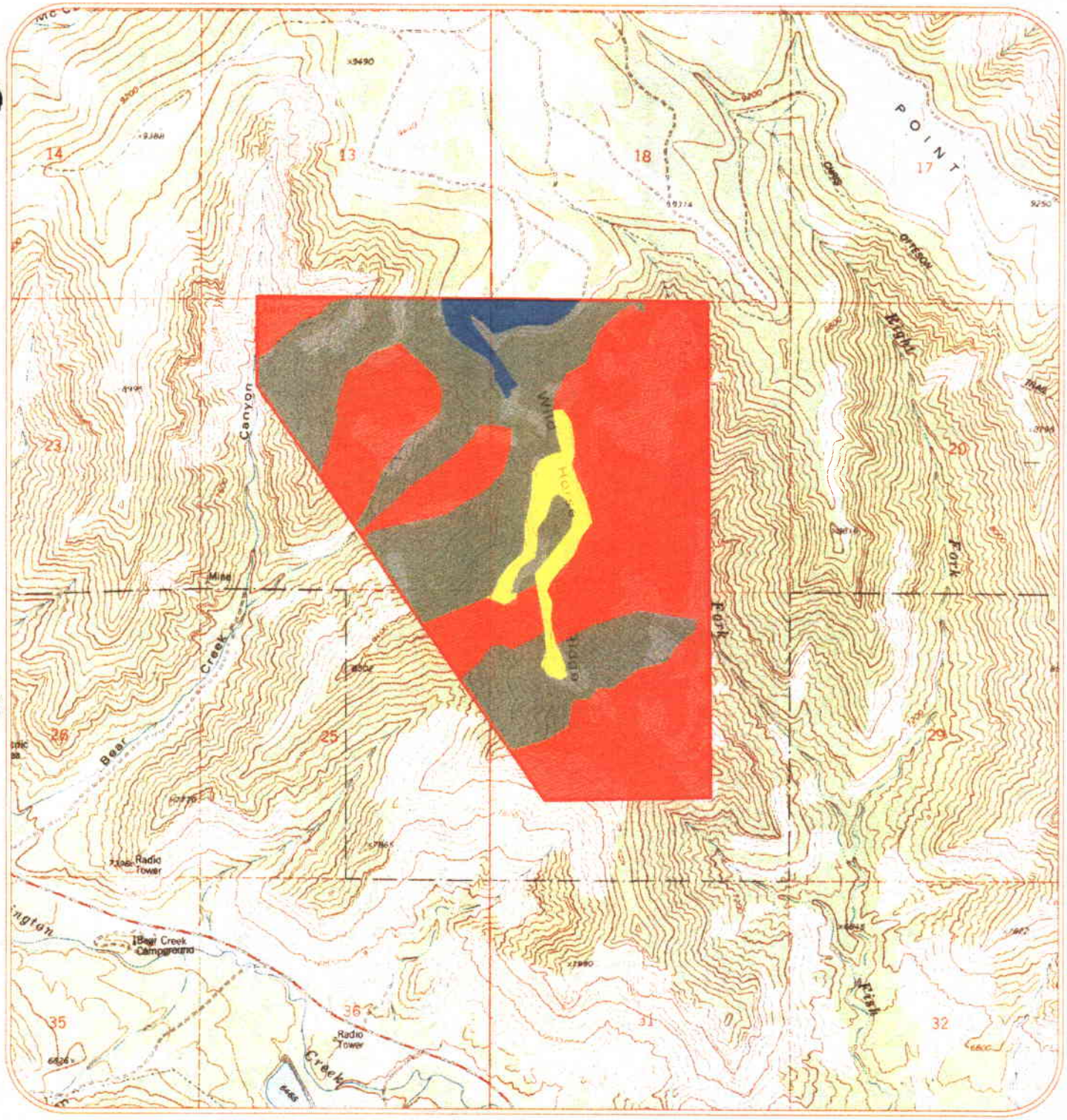

Figure 3. General vegetation communities.

Base: Hiawatha Aerial Photograph
T16S R08W Sections 19 and 30
T16S R07W Sections 24 and 25

1:30,000

0 0.25 0.5 1 1.5 Miles

Inventory Area
Sagebrush/Grass
Grass Slope
Conifer Forest
Cliff/Rock

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Created: 14 June 2004
Edited: Version 1
Printed: 14 June 2004

APPENDIX 3N

RAPTOR PREY BASE STUDY

During the 2001 Wild Horse Ridge permit expansion C. W. Mining impacted wildlife by disturbing less then one acre of big game grazing range. The construction may have also cause the loss of one unconfirmed red tail hawk nest. In order to mitigate these loss C. W. Mining agreed to do a prey base study. Although the study was not a conventional mitigation it was decided upon because regulating agency felt that traditional mitigation options were ineffective and was considering including vegetation enhancement for raptor prey as a mitigation. In order to make this type of mitigation effective the regulating agency needed to determine what prey the raptors were eating. This study was the first step in gathering that information. This study was completed in the fall of 2005

The Division of Wildlife Resources selected 10 nests in or near mine sites located throughout Carbon and Emery county. The nest were selected based on their location, elevation, and accessibility. After the raptors had migrated rock climbers where then used to rappel into the nest and gather any material found. During recover of the material the integrity of the nests were preserved so material was only gathered from the top of the nests and no part of the nest was dismantled to access lower layers from previous years. The remains recovered represented prey from the spring of 2005.

The material collected was then sent to the Integrative Biology Department at Brigham Young University and was analyzed by Professor Clayton White. Only basic analysis was performed since it was determined that the limited data gathered from DNA analysis did not justify the cost.

The table below shows the results of Dr. Whites analysis of the identifiable remains.

High Elevation	Low Elevation	Mixed Elevation
Yellow Bellied Marmot (8)	Domestic Cat (1)	Rock Squirrel (2)
Snowshoe Hair (1)	Morning dove (1)	Feral Pigeon (1)
Clark's Nutcracker (1)		Lepus spp. (2)