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ALL VOLUMES

R645-301-100 Through R645-301-800

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Chapter 2.....Soils

Volume 2.....Chapter 3.....Biology

Chapter 4.....Land Use and Air Quality

Volume 3, 4 & 5.....Chapter 5.....Engineering

Volume 6.....Chapter 6.....Geology

Volume 7 & 8.....Chapter 7.....Hydrology

Chapter 8.....Bonding and Insurance

Volume 9.....Confidential

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File in: Shelf
C/0250005 2009 MRP
Refer to:
☒ Confidential
☐ Shelf
☐ Expandable
Date 101509 For additional information

INTRODUCTION

The Alton coal field is located in T39S, R6W and T39S, R5W SLB&M, Kane County, Utah. Kane County is located in the southwest quarter of Utah. The town of Kanab, which is the Kane County Seat, is located about 30 miles south of the Alton coal field (see attached vicinity and location drawings).

Alton Coal Development, LLC (ACD) is proposing the development of a portion of the Alton coal field. The proposed development is the Coal Hollow Mining Project. The center of the Coal Hollow Project (CHP) is located approximately 3 miles south of the town of Alton, Utah.

ACD has initiated the processes involved to secure coal leases and a permit to mine coal from the project area. In 2004, ACD negotiated surface and coal leases for the private or fee areas of the Alton coal field. In 2004 ACD submitted a Lease by Application (LBA) to the Department of the Interior, Bureau of Land Management State Office, Salt Lake City, Utah for federal coal acreage contiguous to the secured private lease area. In 2006, ACD submitted a Mining and Reclamation Plan (MRP) to the Utah Division of Oil, Gas and Mining (UDOGM). This MRP submittal was determined to be administratively incomplete in August 2006. ACD addressed the deficiencies list provided by the Division and resubmitted the MRP in June of 2007. August 2007, UDOGM completed the Administrative Completeness Review of the June 2007 submission and provided ACD with a deficiencies list. January of 2008, ACD submitted a package addressing the August UDOGM deficiencies list.

The Coal Hollow Project involves a surface mining operation that will produce approximately 2,000,000 tons of coal annually. The coal will be transported from the Alton coal field in trucks (and possibly rail) to markets in the surrounding region. Operations at the mine are expected to be conducted 24 hours a day, 6 days a week.

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In early 2004, ACD initiated base line studies within the area of the Alton coal field. Base line studies are required by state and federal agencies prior to submitting a MRP application.

In 2004, ACD hand picked consultants and personnel to prepare field and base line studies for the Coal Hollow Project. Consultants were selected based on their technical expertise and professional ethical standards. The CHP will be a flagship coal mining operation and its culture of excellence will not start when the first ton of coal is mined, but rather from project inception. ACD seeks to develop a culture of high integrity extending to it personnel, mining operations, community relations, and environmental performance.

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Startup area of the surface mine - phase 1 mining area
View to the south

View of coal seam exposed in Robinson Creek
Phase 1 area of Mining
View to the NE

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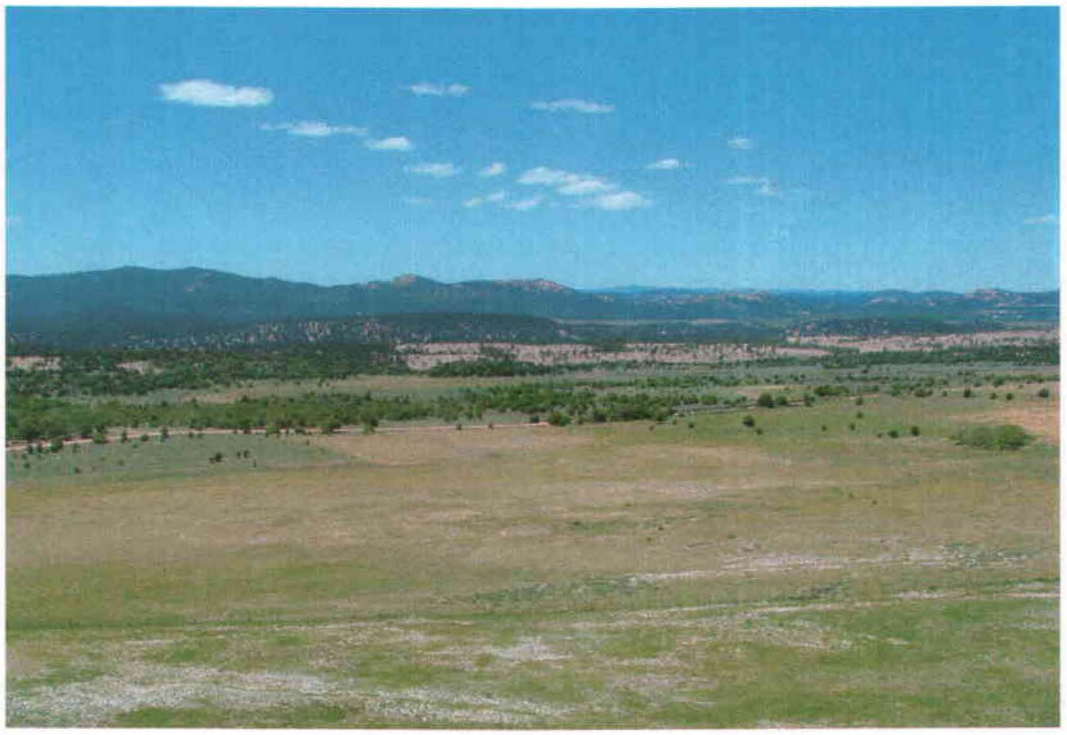
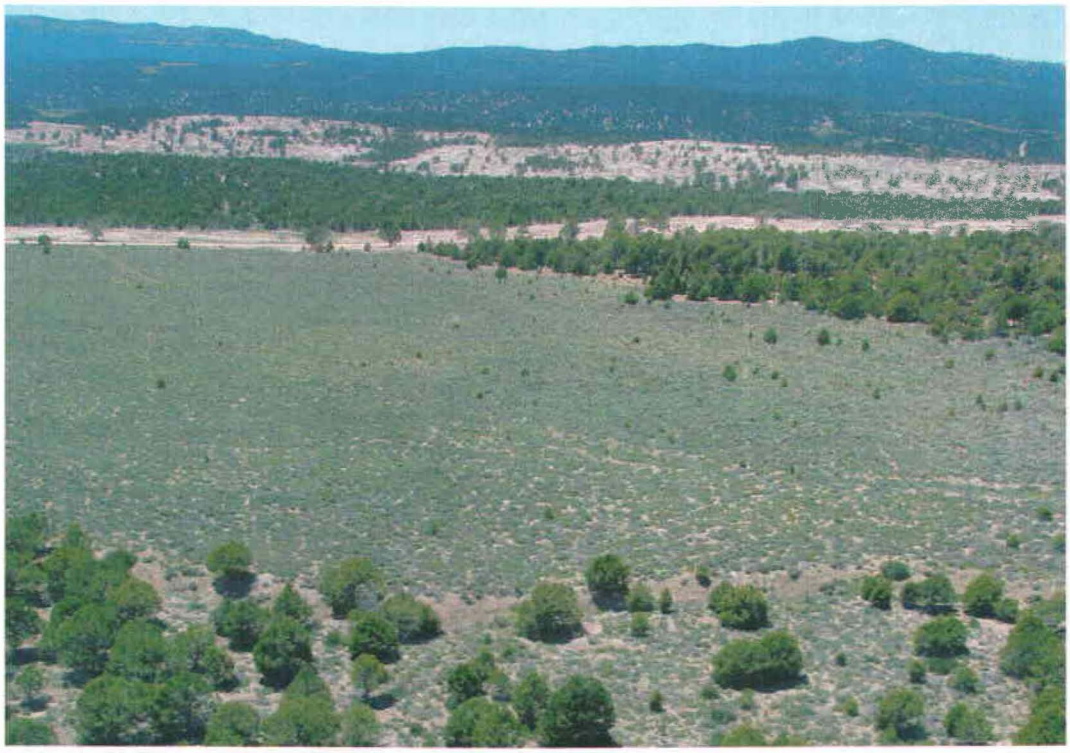
Phase 1 mining area (lest)
Coal loadout (background)
Phase 2 mining area (foreground) – view to the north



Phase 3 & 4 mining area
View to the west

View of the proposed coal loadout area
The town of Alton (background) – view to the NE



View of proposed coal loadout
View to the NE

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View of area to be mined and reclaimed – view to the south

- BLM Pinion-Juniper 2005 treatment area (foreground)
  - The Pinion-Juniper community has out competed with the other vegetative species, creating barren ground
  - The reclamation process will improve the natural ground and vegetation communities by planting more suited vegetative plant species more suitable to the area (grazing and wildlife)
- County Road # 136 running north/south through proposed permit area
- County road will be relocated to bypass mining operations
- Bypass route will start at the bottom right edge of photo
  - Bypass route will be relocated west of existing county road
  - Bypass route will reconnect with existing county road (top of photo) approximately 3 miles of bypass road
- Mining operations will be cordoned off to civilian traffic
- After coal is removed and the area reclaimed, the surface contour will be reduced by 0.7'

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View of area to be mined and reclaimed – view to the north

Location of 1960's reclaimed Alton Coal mine
Portal was in cleared area of hillside

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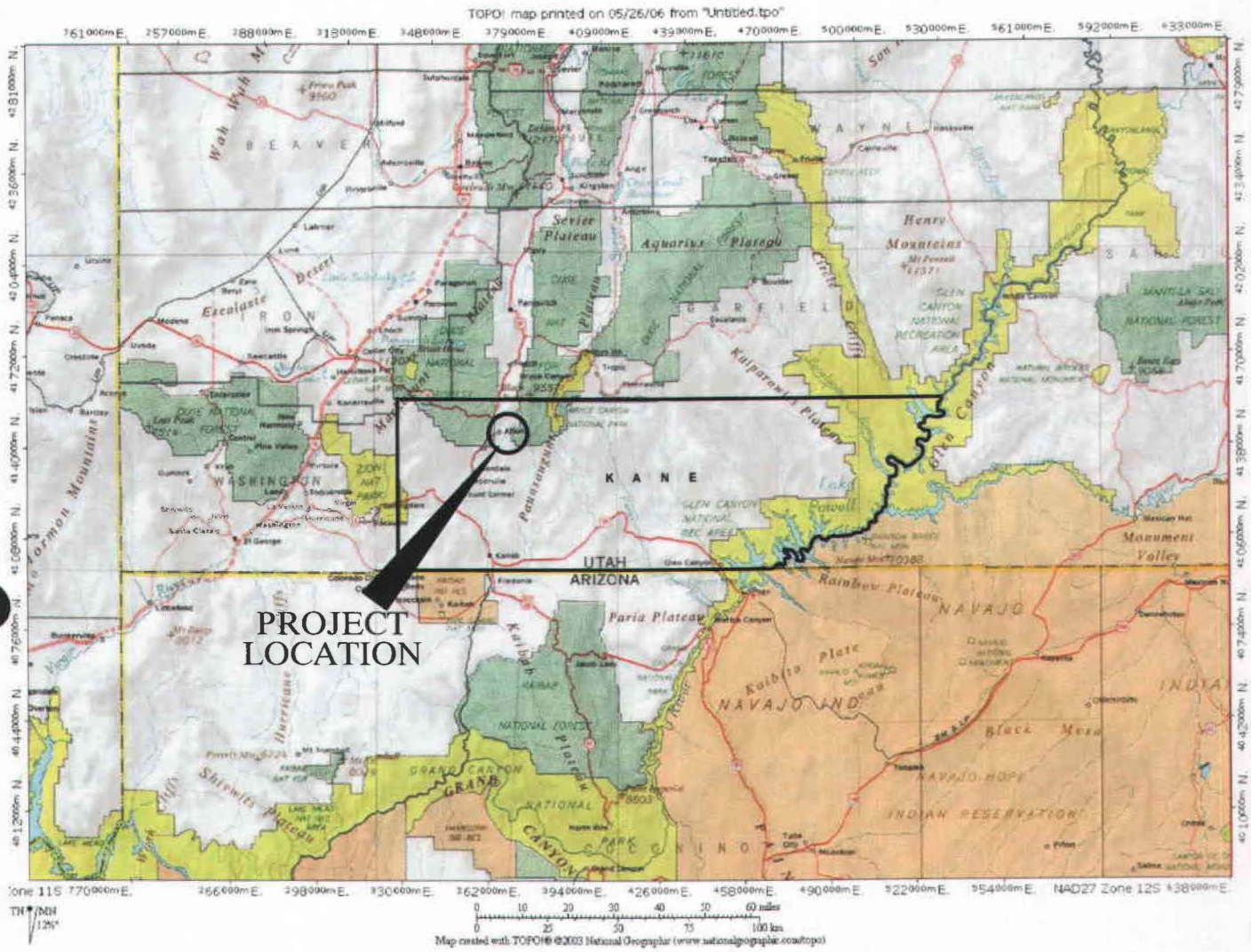
ALTON COAL DEVELOPMENT
KANE COUNTY, STATE OF UTAH
SECTIONS 19, 20, 29, & 30, T39S, R5W, S.L.B.&M.



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DRAWN BY:	CHECKED BY:
N. BUTKOVICH	APC
DRAWING:	DATE: 5/26/06
	SCALE: NOT TO SCALE
JOB NUMBER: 1400	SHEET

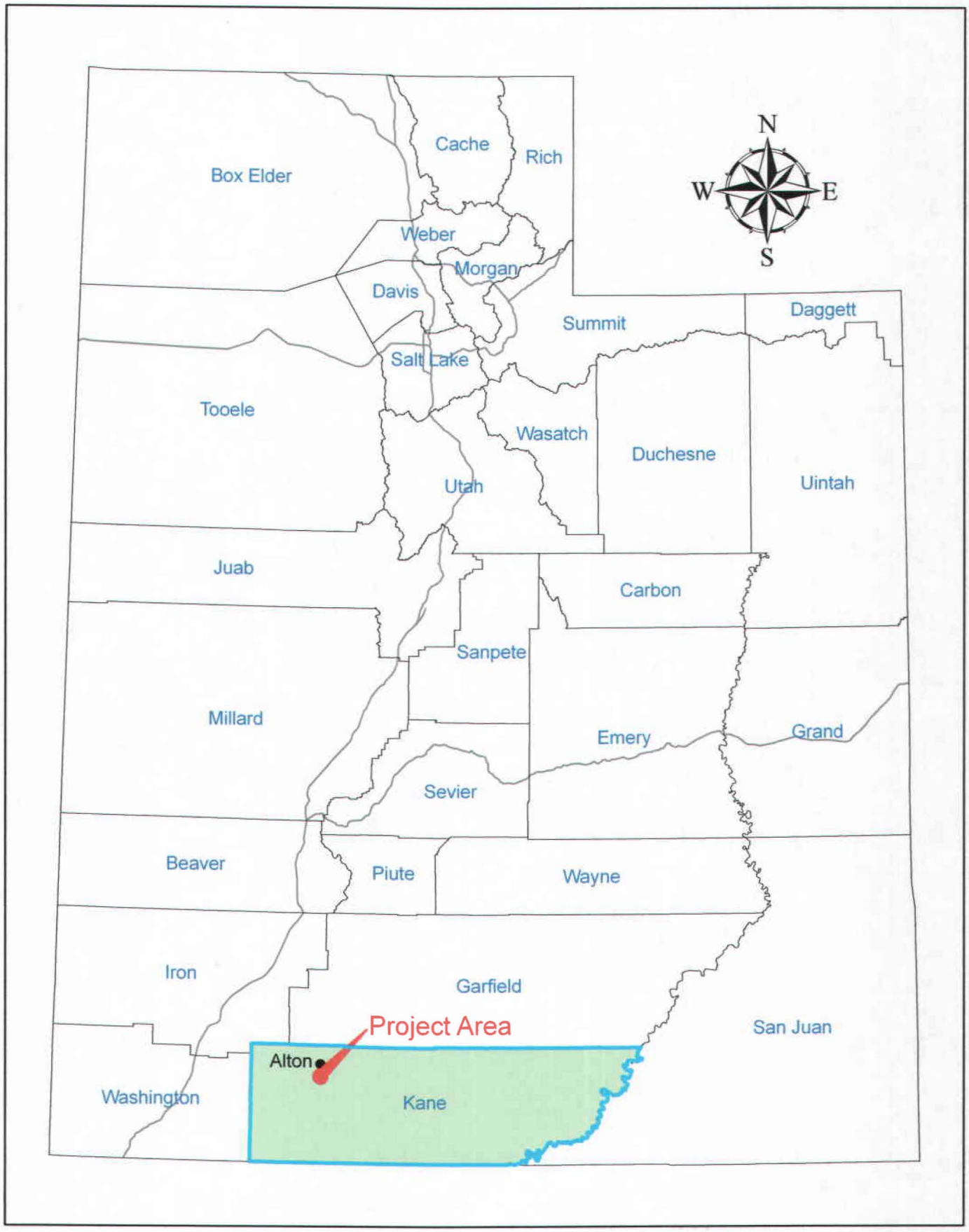
REVISIONS	
DATE:	BY:
6/6/06	NLB

VICINITY MAP

COAL HOLLOW PROJECT
ALTON, UTAH

Registered Professional Engineer
No. 144842
JOHN S. HUEFNER
State of Utah

Alton Coal Development
Coal Hollow Project
195 North, 100 West
P.O. Box 1230
Huntington, Utah 84528
Phone (435)687-5310
Fax (435)687-5311



General Location

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CHAPTER 1

Legal, Financial, Compliance and Related Information

R645-301-100

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R645-301-100

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CHAPTER 1

R645-301-100. GENERAL CONTENTS

110 LEGAL, FINANCIAL, COMPLIANCE, and RELATED INFORMATION

110 INTRODUCTION

Alton Coal Development, LLC is submitting a Mining and Reclamation Plan for the Coal Hollow Project to the Utah Division of Oil, Gas and Mining pursuant to rules governing coal mine permitting at R645-301-100 et seq. Permit Area Base Drawing – Drawing 1-1.

112 IDENTIFICATION OF INTERESTS

112.100 Business Entity

Applicant, Alton Coal, LLC, is a limited liability company duly organized and validly existing under the laws of the State of Nevada, and authorized to conduct business under the laws of the State of Utah.

112.200 Permit Applicant and Permittee:

Alton Coal Development, LLC
463 N. 100 W, Suite 1
Cedar City, UT 84720
Telephone (435) 867- 5331
Employer I. D. #42-1655092
Social Security numbers of Alton Coal Development, LLC's members and manager provided in "CONFIDENTIAL BINDER"

112.210 Operator:

Alton Coal Development, LLC
463 N. 100 W, Suite 1
Cedar City, UT 84720
Telephone (435) 867- 5331
Employer I. D. #42-1655092

112.220 Resident Agent:

Corporation Trust Company of Nevada
6100 Neil Road
STE 500
Reno, NV 89511

For Utah:

Chris R. McCourt
463 N. 100 W., Suite 1
Cedar City, Utah 84720
(435) 867-5331

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112.230 Abandoned Mine and Reclamation Fee

Robert C. Nead, Jr. will pay the abandoned mine land reclamation fee.

112.300 Ownership and Control

Alton Coal Development, LLC, is the sole party in interest, owning and controlling this application.

112.310 Members and Managers of Alton Coal Development, LLC

Social Security numbers of Alton Coal Development, LLC's members and manager provided in "CONFIDENTIAL BINDER" Appendix 1-1

Manager	CHRIS R. MCCOURT 1461 N. 3775 W. Cedar City, UT 845721
Member	STONIE BARKER, JR 1878 Mission Dr. Naples, FL 34109
Member	ALEXANDER D. MIRROW 2514 Oleaster Ct. Grand Junction, CO 81505
Past Member	BEVERLY HOLWERDA 960 Cape Marco Drive Marco Island, FL 34145
Member	ROBERT C. NEAD, JR 6602 Ilex Circle Naples, FL 34109
Member	JAMES J. WAYLAND 2841 Capistrano Way Naples, FL 34105
Member	ANTHONY P. GARGIULO 960 Cape Marco Dr. #1001 Marco Island, FL 34145

All members and managers use the employer identification number of Alton Coal Development, LLC No. 42-1655092

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112.320 Relationship to the Applicant

Each of the above-listed managers and members owns and controls more than 10% of Alton Coal Development, LLC. The following is a listing of company ownership as defined by R645-100-200 "Owned or Controlled":

Stonie Barker, Jr.: 10% Ownership
Alexander D. Mirrow: 15% Ownership
Robert C. Nead, Jr.: 15% Ownership
James J. Wayland: 50% Ownership
Anthony O. Gargiulo: 10% Ownership
Beverly Holwerda 0% Ownership

112.330 Title and Date of Position

The manager listed in 112.310 was appointed July 17, 2007. The following is a listing of each member and their individual date of appointment and/or departure:

Stonie Barker, Jr.: 9/9/04
Alexander D. Mirrow: 9/9/04
Robert C. Nead: 9/9/04
James J. Wayland: 9/9/04
Anthony O. Gargiulo: 1/1/08
Beverly Holwerda: 9/9/04 with departure 4/30/08

112.340. Ownership or control of Other Coal Mining and Reclamation Operations

Neither Alton Coal Development, LLC nor its manager or members owns and has not in the previous five years owned another coal mining and reclamation operation.

112.350 Application Number – Other Pending Coal Mining and Reclamation Operations

Neither Alton Coal Development, LLC nor its manager or members owns any pending coal mine permits.

112.400 Coal Mining and Reclamation Operations Owned or Controlled

Neither Alton Coal Development, LLC nor its manager or members owns or controls any other coal mining and reclamation operations.

112.410 Coal Mining and Reclamation Operations Owned or Controlled by Managers or Members of Alton Coal Development, LLC

Neither Alton Coal Development, LLC nor its manager or members owns or control any other coal mining and reclamation operations.

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112.420 Ownership and Control Relationship of Managers and Members of Alton Coal Development, LLC

Each of the managers and members listed at § 112.320 own or control more than 10% of Alton Coal Development, LLC

112.500 Legal or Equitable Owner of the Surface and Mineral Properties

The legal and equitable owners of the properties to be affected by this mining operation during the duration of the permit period along with legal descriptions are included in this section. Surface and coal ownership are also shown on Drawings 1-3 and 1-4. The following table is a summary of the ownership within the Permit boundary.

Permit Area Ownership (Acres)**				
	Fee	Federal	State	Total
Surface	635	0	0	635
Coal*	435	200	0	635
Total				
Note*: Federal minerals located within the Permit area are not planned for mining as part of this application. These areas have been included as part of the LBA application described in 112.800. Note**: Acreages are approximate based on legal descriptions				

The legal description for lands included within the Permit Boundary is provided below for each surface owner.

SURFACE OWNERSHIP:

Owner/Lessor:

C. Burton Pugh
533 N 650 E
Lindon, Utah 84042-1567
801-785-6220

Lessee:

Alton Coal Development, LLC

Legal Description (C. Burton Pugh Property):

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 30: All of Section Lot #1 (NW¼ NW¼); NE¼ NW¼ ; N½ NE¼ ; ALSO: BEGINNING 3.50 chains West of the East Quarter corner of Said Section 30, and running South 34° 34' West 22.64 chains to the 1/16 section line; thence West 2.64 chains to the Southwest corner of NE¼ SE¼ of Said Section 30; thence North 40.00 chains; thence East 20.00 chains; thence South 14.69 chains; thence southwesterly to the point of beginning

....containing 217.64 acres, more or less.

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TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 29: BEGINNING at the Northwest corner of Said Section 29, and running thence South 34.69 chains; thence North 33°22' East 35.50 chains; thence North 40° West 0.58 chains; thence North 37°30' East 12.30 chains; thence West 22.23 chains to the point of beginning.

....containing 36.04 acres, more or less.

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 19: SW¼SE¼, E½SE¼, SE¼NE¼

....containing 160.0 acres, more or less

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 20: SW¼

....containing 160.0 acres, more or less

COAL OWNERSHIP:

Owner/Lessor:	*Lessee:*
C. Burton Pugh 533 N 650 E Lindon, Utah 84042-1567 801-785-6220	Alton Coal Development, LLC
Roger M. Pugh 140 South 100 West Kanab, UT 84741	
Mark and Margaret Moyers 9397 Avanyu Drive Pleasant Grove, UT 84062	

SURFACE OWNERSHIP:

Owner/Lessor:	*Lessee:*
Alecia Swapp Dame Trust Through Richard, Trustee 1620 Georgia Ave. Boulder City, NV 89 702-293-4773	Alton Coal Development, LLC

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Legal Description (Alecia Dame Swapp Trust):

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 30: BEGINNING at a point 5.31 chains North of the E¼ corner of Said Section 30, and running thence South 45.31 chains; thence West 20.00 chains; thence North 20.00 chains; thence East 2.64 chains; thence North 34° 34' East 22.64 chains to the 1/16 section line; thence North 33° 22' East to the point of beginning.

....containing 61.96 acres, more or less.

COAL OWNERSHIP:

Owner/Lessor:	*Lessee:*
Alecia Swapp Dame Trust Through Richard, Trustee 1620 Georgia Ave. Boulder City, NV 89 702-293-4773	Alton Coal Development, LLC

112.600 Owners of Record of Property Contiguous to Proposed Permit Area

Owners of surface properties contiguous to the proposed permit area are shown on Drawing 1-3 and the name and address of each such owner is as follows:

Department of the Interior, Bureau of Land Management
District and Regional Office
Salt Lake City, Utah

Darlynn and Arlene Sorensen
Orderville, Utah
435-648-2462

112.700 MSHA Numbers

The MSHA Mine Identification Number for the Coal Hollow Project is 42-02519.

112.800 Interest in Contiguous Lands

The applicant has interest in lands contiguous to the permit area. A Lease by Application (LBA) is currently being processed by the United States Department of the Interior, Bureau of Land Management, Salt Lake City, Utah.

Alton Coal Development, LLC, the sole party in interest, submitted the LBA application in September, 2004. The LBA is contiguous to the permit area and contains approximately 3,581 acres. See Drawing 1-2 for LBA delineation.

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In addition to the LBA application, Alton Coal Development, LLC also has property leased from C. Burton Pugh located east of the permit boundary. This property which is contiguous to the permit area, is part of a land tract (9-5-20-2) owned by Mr. Pugh that is split across the permit boundary and is located in Section 20, Township 30 South, Range 5 West. This entire tract was leased prior to the final determination of the Permit Boundary (9/10/04). The area leased from Mr. Pugh outside the Permit Boundary are not planned for development except for approximately 43 acres located in the SW¼, NW¼ Section 20 which is included as part of the LBA application. The 43 acres would possibly be developed for surface coal mining operations if the LBA mining rights are successfully acquired. Land tracts leased by Alton Coal Development, LLC within and contiguous to the permit area are identified on Drawing 1-3.

112.900 Certification of Submitted Information

After Alton Coal Development, LLC is notified that the application is approved, but before the permit is issued, Alton Coal will update, correct or indicate that no change has occurred in the information submitted under R645-301-112.100 through .800.

113 VIOLATION INFORMATION

Neither the applicant, affiliates, members or managers or persons controlled by or under common control with the applicant has: (i) had a federal or state mining permit suspended or revoked in the last five years; (ii) nor forfeited a mining bond or similar security deposited in lieu of a bond; (iii) nor received a violation during the last three year period.

114 RIGHT OF ENTRY INFORMATION

Applicant bases its right to enter and begin coal mining activities in the permit area and the consent of the surface owner to extract coal by surface mining methods upon the following documents:

Lessor: C. Burton Pugh — *Lessee:* Alton Coal Development, LLC
Surface and Mineral Lease, dated 9/10/04; originally recorded 5/25/06

Lessor: Roger M. Pugh — *Lessee:* Alton Coal Development, LLC
Mineral Lease, dated 9/11/08; recorded 9/11/08

Lessor: Margaret and Mark Moyers — *Lessee:* Alton Coal Development, LLC
Mineral Lease, dated 6/26/08; recorded 7/21/08

Lessor: Alecia Swapp Dame Trust — *Lessee:* Alton Coal Development, LLC
Surface and Mineral Lease, dated 4/29/05; recorded 5/17/06

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Copies of these lease assignments are included in Appendix 1-2 located in the Volume 7, Confidential binder.

115 STATUS OF UNSUITABILITY CLAIMS

115.100 The permit area is not within an area or under study as an area designated as unsuitable for mining under R645-103-400, nor has any petitions been filed with the UDOGM under R645-103-420 that could affect the proposed permit area. The Coal Hollow Project is located on private lands adjacent to federal lands, which after careful consideration were declared suitable for mining in 1980 by then Secretary of Interior Andrus. Secretary's Decision, Petition to Designate Certain Federal Lands In Southern Utah Unsuitable for Surface Coal Mining, OSM Ref No. 79-5-001, dated December 16, 1980, copy attached at Appendix 1-3.

This petition was filed under the provisions of section 522(c) of the federal Surface Mining Control and Reclamation Act ("SMCRA"). OSM Notice, Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations, 45 fed. Reg. 3398, Jan. 17, 1980, attached at Appendix 1-3.

Those federal lands in the Petition area found suitable for mining include lands adjacent to the private lands which the Project has included in a federal lease by application and located in Kane County, Utah within Township 39 South, Ranges 5 and 6 West, SLM. Secretarial Decision at Paragraph 4. The Secretarial Decision was based on an extensive Administrative Record, including the Petition filed under Section 533 of SMCRA, 30 U.S.C. Section 1272, public hearings, a combined petition evaluation document and environmental impact statement published in two volumes on November 26, 1980 as, "Southern Utah Petition Evaluation Document" and the "Southern Utah Petition Evaluation Document - Comments and Responses." The Secretarial Decision was further supported by a 52 page Statement of Reasons, dated January 13, 1981, attached at Appendix 1-3.

The Secretarial Decision was upheld by the federal court in *Utah International, Inc. v. Watt*, 553 F. Supp. 872 (D. Utah 1982).

115.300 Coal mining and reclamation activities at the Coal Hollow Project are not planned within 300 feet of an occupied dwelling or 100 feet of a public road. Drawing 1-5 shows the proximity of the Swapp Ranch to the planned operations.

116 PERMIT TERM

116.100 There are 3 mining phases associated with this permit term. The first phase of mining is anticipated to start July 1, 2008. Each mining phase has a 1 year term. Phase 3 is anticipated to conclude in year 2012.

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Acres of disturbance per Mining Phase

Phase 1	286 acres
Phase 2	109 acres
Phase 3	38 acres

116.200 Permit Term

The Coal Hollow Mine Project is proposed for a 5-year term under the Permanent Regulatory Program for 5 years

117 INSURANCE, PROOF OF PUBLICATION

Proof of publication pursuant to R645-303-322 is included in Appendix 1-5.

117.100 Certificate of Liability Insurance

A copy of the Certificate of Liability Insurance is found in Appendix 1-4.

118 PERMIT FILING FEE

A copy of this permit is on file with the Utah Division of Oil, Gas and Mining (UDOGM), P.O. Box 145801, Salt lake City, Utah 84114-5801. A filing fee of $5.00 accompanied permit submittal.

120 PERMIT APPLICATION FORMAT AND CONTENTS

This permit application contains information and will comply with R645-301-120. A notarized statement attesting to the accuracy of this information is set forth at Appendix 1-6.

130 REPORTING OF TECHNICAL DATA

All technical data submitted in the permit application will be accompanied by the name or organization responsible for the collection and analysis of data, dates of collection and descriptions of methodology used. Technical analyses will be planned by or under the direction of a qualified professional in the subject to be analyzed.

The following assisted or were consulted in the preparation of this permit application:

State of Utah, Department of Natural Resources
Division of Oil, Gas and Mining
Salt Lake City, Utah

Department of the Interior, Bureau of Land Management
District and Regional Office
Kanab and Salt Lake City, Utah

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United States Geological Survey, Utah Region
Salt Lake City, Utah

United States Department of Agriculture
Natural Resources Conservation Service
Salt Lake City, Richfield and Cedar City, Utah

State of Utah, Department of Natural Resources
Division of Wildlife Resources (DWR)
Salt Lake City, Price and Cedar City, Utah

Dr. Patrick D. Collins
Mt. Nebo Scientific Research & Consulting
Springville, UT

Erik Petersen, P.G.
Petersen Hydrologic, LLC
Lehi, UT

John T. Boyd Company
James Boyd
Mining & Geological Consulting
Canonsburg, PA

John T. Boyd Company
Rich Bate
Mining & Geological Consulting
Denver, CO

Keith Montgomery
Montgomery Archaeological
Moab, UT
Dr. Stephen Petersen
Philomath, OR

Larry Hayden-Wing
Hayden-Wing Associates, LLC
Laramie, WY

Mark Page
Water Rights Consultant
Price, UT

D.A. Smith Drilling
Loma, CO

Dr. James E. Nelson
Brigham Young University
Provo, UT

Talon Resources, Inc
Huntington, UT

C. Burton Pugh
Lindon, UT

Richard Dame
Boulder City, NV

University of Miami
Miami, FL

Geochron Laboratories
Cambridge, MA

Energy Labs
Billings, MT

Taylor Geo-Engineering
Alan O. Taylor
Lehi, UT

Long Resource Consultants
Robert E. Long
Morgan, UT

JBR Environmental, Inc.
Dawn Whaley
Sandy, UT

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Kane County
76 North Main
Kanab, UT

Bruce Chesler
Escalante, UT

Heaton Livestock
PO Box 100773
Alton, UT

A.H. Hamblin
Paleontogical Consulting
Cedar City, UT

Patricia Stavish
Montgomery Archeological
Moab, UT

Mike Shurtz, C.E.T
AGEC
Cedar City, UT

Byron Caton
SGS North America, Inc
Denver, CO

Inter-Mountain Laboratories
Karen Secor
1673 Terra Avenue
Sheridan, WY

Glenn Grossman
Will Spitzenberg, P.E.
Boss Engineering
Pleasant Grove, UT

Tom Campbell
TerraTek
Salt Lake City, UT

140 DRAWING AND PLANS

The Drawing and plans in the Mining and Reclamation Plan are submitted consistent with the requirement of R645-301-140.

150 COMPLETENESS

Alton Coal Development, LLC represents that the information contained in the Coal Hollow Mining and Reclamation Plan permit application to be complete and correct.

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APPENDIX 1-3

Exhibit 1 Petition to Designate Certain Federal Lands

Exhibit 2 Lands as Unsuitable for Surface Coal Mining Operations

Exhibit 3 The Secretarial Decision

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Exhibit 1

Petition to Designate Certain Federal Lands

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United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PETITION TO DESIGNATE CERTAIN FEDERAL LANDS IN SOUTHERN UTAH UNSUITABLE FOR SURFACE COAL MINING	OSM REFERENCE No: 79-5-001

2005 JUL 18 PM 1:50 BLM

SECRETARY'S DECISION

Under section 522 of the Surface Mining Control and Reclamation Act of 1977, I have been petitioned by the Sierra Club, Environmental Defense Fund, Friends of the Earth and others to declare certain lands adjacent to Bryce Canyon National Park in Southern Utah unsuitable for all types of surface coal mining operations. Other individuals also intervened in support of the petition. Utah International Inc. and Nevada Electric Investment Co., who hold Federal coal leases in the petition area, were granted leave to intervene in opposition to the petition.

As required by sections 522 (c) and (d) of the Surface Mining Act, public comment on the petition was sought, public hearings were held in Utah and a detailed statement was prepared to evaluate the petition and the alternative actions available to me in reaching a decision on the petition. In reaching my decision on the Southern Utah petition, I have considered the information contained in the final combined petition evaluation and environmental impact statement, as well as the information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, industry and members of the public in the form of testimony at the public hearings and all written comments received up to the close of the comment period on October 20, 1980.

Based upon all of that information, which is in the administrative record of this proceeding, I have reached the following decision:

1. I hereby designate as unsuitable for surface coal mining operations, including surface impacts incident to underground mining which would be visible from Bryce Canyon National Park, all Federal lands in townships T.40S, R. 4W; T. 39S, R. 4W; T. 38S, R. 4W; T. 38S, R. 3W; T. 37S, R. 4W; T. 37S, R. 3W; and T. 36S, R. 3W; of the Salt Lake Meridian; and T. 36S, R. 2W, of the Salt Lake Meridian is designated unsuitable only for mining by surface methods;

2. I base this designation on the criteria of Section 522(a)(3)(B) of the Surface Mining Act which provides that an area may be designated unsuitable for all or certain types of surface coal mining operations if such operations will "affect fragile or historic lands in which such operations could result in significant damage to important historic, cultural, scientific, and esthetic values and natural systems";

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3. My statement of reasons, to be issued shortly, will explain the basis for my conclusions that mining in the designated areas would cause significant cumulative impacts on Bryce Canyon National Park by reducing visibility, by creating dust plumes and large disturbed areas which would be visible for long periods of time from the park, and by generating mechanical activity and blasting that would be audible from the park, thereby adversely affecting the values for which the park was established and, thus, the experience of the park's visitors;

4. I decline to designate, and hereby reject the petition as it relates to, remaining areas of Federal lands other than those described above in paragraph 1;

5. Upon review of any specific mining plan and permit application for surface mining of the other Federal leases in the Alton coal field that are not covered by this designation, or underground mining in the designated areas, the Department, through the National Park Service and the Office of Surface Mining, will consider whether potential impacts on the visual resources and noise levels in the park from mining on these leases need to be mitigated by means of special stipulations or conditions;

6. Under no circumstances should this decision become the only basis for protection of the values for which Bryce Canyon National Park was established and I direct that these park values be taken into account in future decisions by the bureaus of this Department on mining plans, permit applications or other activities on undesignated Federal lands near the park;

7. Appropriate bureaus of the Department are hereby directed to take all necessary actions under section 522(b) of the Surface Mining Act or other authority to implement this decision for the areas listed in paragraph 1 above; and

8. The lessee-intervenors' claims of substantial legal and financial commitments in the leased area, under section 522 (a)(6) of the Surface Mining Act, are being processed separately according to the procedures of the Office of Surface Mining, and a decision on those claims will be issued subsequently by that office.

Copies of this decision should be sent simultaneously by certified mail to all parties in this proceeding. This decision will become final upon the date of issuing my statement of reasons. Any appeal from this decision must be filed within 60 days from that date in the United States District Court for Utah, as provided in section 526(a)(1) of the Surface Mining Act.

December 16, 1980
Date

Cecil D. Andrus
Cecil D. Andrus

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Exhibit 2

Lands as Unsuitable for Surface Coal Mining Operations

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Office of Surface Mining Reclamation and Enforcement

Extension of Public Comment Period on the Texas Amended Program Submission for the Regulation and Control of Surface Coal Mining

AGENCY: Office of Surface Mining Reclamation and Enforcement (OSM), United States Department of the Interior.

ACTION: Extension of public comment period on the Texas amended program submission of the regulation and control of surface coal mining.

SUMMARY: OSM is extending the period for review and comment on the proposed regulatory program until January 21, 1980. This action further amends procedures announced on December 21, 1979 (44 FR 75733), which extended the public comment period until December 28, 1979. The extended period provides additional opportunity for the public to review and comment on amendments to the proposed regulatory program submitted by Texas and on summaries of meetings and communications between OSM and Texas on these amendments.

DATES: All comments must be received on or before 5:00 p.m. on January 21, 1980, to be considered in the Secretary's decision on the proposed Texas regulatory program.

ADDRESS: The proposed Texas regulatory program, as amended, is available for review during business hours at:

The Office of Surface Mining Reclamation and Enforcement, Scarritt Building, 818 Grand Avenue, Kansas City, Missouri 64106, Telephone (816) 374-3820.

Railroad Commission of Texas, Capitol Station, P.O. Box Drawer 12967, Austin, Texas 78711.

OSM Headquarters, Department of the Interior, Room No. 135, 1951 Constitution Avenue NW., Washington, D.C. 20240, Telephone (202) 343-4728.

Written comments should be delivered by 5:00 p.m. on January 21, 1980 to:

The Office of Surface Mining Reclamation and Enforcement, Region IV, Scarritt Building, 818 Grand Avenue, Kansas City, Missouri 64106.

OSM Headquarters, Department of the Interior, Room No. 135, 1951 Constitution Avenue NW., Washington, D.C. 20240, Telephone (202) 343-4728.

SUPPLEMENTARY INFORMATION: This extended period of of public comment is to allow opportunity for any interested persons to review and comment on a December 31, 1979, letter from the Director of the Texas Surface Mining and Reclamation Division to the Regional Director. The letter concerns those portions of the Texas program dealing with intervention in administrative proceedings, *ex parte* contact during administrative proceedings, and discovery in administrative proceedings. This announcement is made in keeping with OSM's commitment to public participation, as a vital component in fulfilling the purposes of the Surface Mining Control and Reclamation Act of 1977.

Dated: January 11, 1980.

Carl C. Close,

Acting Director.

[FR Doc. 80-1418 Filed 1-16-80; 8:45 am]

BILLING CODE 4310-05-M

Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations

AGENCY: Office of Surface Mining Reclamation and Enforcement.

ACTION: Notice of Receipt of a Complete Petition for Designation of Lands as Unsuitable for Surface Coal Mining Operations.

SUMMARY: Pursuant to § 769.16 of Title 30, Code of Federal Regulations, notice is given that the Office of Surface Mining has received a petition to designate certain Federal lands in southern Utah as unsuitable for mining. The petition is described below:

Location of Lands Petitioned for Designation

Petitioners: Environmental Defense Fund, Friends of the Earth, Sierra Club Legal Defense Fund, Sylvan Johnson, Leon Lippincott, Carolyn Lippincott, Jet Mackelprang, Cynthia Myers, Susan Hilton and Larry Little

State: Utah

Counties: Kane and Garfield

Township, Range, Section: The federal lands within Salt Lake Meridian, Utah

T.40S, R.6W, S.L.M.
T.40S, R.5W, S.L.M.
T.40S, R.4½W, S.L.M.
~~T.40S, R.4W, S.L.M.~~
T.39S, R.6W, S.L.M.
T.39S, R.5W, S.L.M.
T.39S, R.4½W, S.L.M.
~~T.39S, R.4W, S.L.M.~~
~~T.38S, R.4W, S.L.M.~~
~~T.38S, R.3W, S.L.M.~~
~~T.37S, R.4W, S.L.M.~~
~~T.37S, R.3W, S.L.M.~~
T.37S, R.2W, S.L.M.
~~T.36S, R.3W, S.L.M.~~
~~T.36S, R.2W, S.L.M.~~

Office of Surface Mining Reference Number: 79-6-001.

The petition, filed under Section 522 of the Surface Mining Control and Reclamation Act of 1977, seeks to have specified Federal lands in the area of Bryce Canyon National Park and the Dixie National Forest declared as unsuitable for mining. The petition was submitted to the Office of Surface Mining on November 28, 1979 and was found to be complete on December 27, 1979.

A review of the area's suitability for mining has been undertaken by this office. In addition, the Bureau of Land Management—Utah State Office and the Utah Regional Forester—United States Forest Service as the surface managing agencies for the petitioned area will make recommendations on the petition.

A public hearing is planned for late September 1980, notice of which will be given prior to the hearing. A decision on the petition will be made by November 28, 1980.

This notice is issued at this time for the convenience of the public. The public file on the petition is available for public review during normal working hours at the Division of State and Federal Programs, Office of Surface Mining, Region V, second floor, Brooks Towers, 1020 15th Street, Denver, Colorado and at the Kanab Resource Area Headquarters, Bureau of Land Management, 320 North 1st East, Kanab, Utah.

Copies of the petition are available to the public from the Office of Surface Mining, Region V. Relevant information and comments on the issues raised in the petition are solicited.

FOR FURTHER INFORMATION CONTACT: Barbara J. West, Office of Surface Mining, Region V, Brooks Towers, 1020 15th Street, Denver, Colorado, 80202.

SUPPLEMENTAL INFORMATION: Under Section 522 of the Surface Mining Reclamation and Control Act of 1977 and its implementing regulations, persons with interests which are or may be adversely affected by surface coal mining operations may petition the Office of Surface Mining to have an area designated as unsuitable for all or certain types of surface coal mining operations. In the petition submitted to OSM, the petitioners allege that (1) the lands in question could not be reclaimed in accordance with the requirements of the Act; (2) surface coal mining operations could result in significant damage to important historic, cultural, scientific, and aesthetic values and natural systems of fragile lands; and (3) such operations could result in a substantial loss or reduction of long-range productivity of water supply or of food or fiber products, including damage

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to aquifers and aquifer recharge areas of renewable resource lands. The proximity of mineable coal lands to Bryce Canyon National Park and the Dixie National Forest and the possible adverse affects of mining on the Park and Forest are of particular concern to the petitioners.

After completion of the analyses and hearing mentioned above, the Department can designate the area or a portion thereof as unsuitable for all or certain types of surface coal mining operations (which includes the surface effects of underground mining). The agency may also find the area as suitable for surface coal mining operations.

Information on which to base analyses of the issues raised by the petitioners is being sought from all interested parties.

Donald A. Crane,

Regional Director.

[FR Doc. 80-1597 Filed 1-16-80; 8:45 am]

BILLING CODE 1517

INTERNATIONAL TRADE COMMISSION

Certain Rotary Scraping Tools; Commission Determination and Order

[Investigation No. 337-TA-62]

In the matter of certain rotary scraping tools.

The U.S. International Trade Commission conducted an investigation under the authority of section 337 of the Tariff Act of 1930, as amended (19 U.S.C. 1337), of alleged unfair methods of competition and unfair acts in the unauthorized importation into or sale in the United States of certain rotary scraping tools by reason of (1) the infringement of U.S. Letters Patent No. 3,958,294, and (2) misleading packaging and/or deceptive advertising of the imported rotary scraping tools, including the simulation of complainant's trade dress. On January 9, 1980, the Commission unanimously determined that there was a violation of section 337 and ordered that rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294 be excluded from entry into the United States for the term of that patent (until May 25, 1993), unless the importation is licensed by the patent owner.

The purpose of the Commission determination and order which follow is to provide for the final disposition of the Commission's investigation on certain rotary scraping tools.

Determination

Having reviewed the record compiled in this investigation, the Commission on January 9, 1980, determined—

1. That with respect to eight of the respondents in this investigation,[1] there is a violation of section 337 of the Tariff Act of 1930, as amended, in the importation and sale by the owner, importer, consignee, or agent of either, of rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294, the effect of which is to substantially injure an industry, efficiently and economically operated, in the United States;

2. That the appropriate remedy for such violation is to direct that rotary scraping tools manufactured abroad which infringe U.S. Letters Patent No. 3,958,294 be excluded from entry into the United States for the term of said patent, except where such importation is licensed by the owner of said patent;

3. That, after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the U.S. economy, the production of like or directly competitive articles in the United States, and U.S. consumers, such rotary scraping tools should be excluded from entry for the term of said patent, except where such importation is licensed by the owner of said patent; and

4. That the bond provided for in subsection (g)(3) of section 337 of the Tariff Act of 1930, as amended, be in the amount of 484 percent ad valorem of the imported article (ad valorem to be determined in accordance with sec. 402 of the Tariff Act of 1930, as amended (19 U.S.C. 1401a)).

Order

Accordingly, it is hereby ordered—

1. That rotary scraping tools which infringe U.S. Letters Patent No. 3,958,294 are excluded from entry into the United States for the term of said patent, except where such importation is licensed by the owner of said patent;

2. That rotary scraping tools ordered to be excluded from entry are entitled to entry into the United States under bond in the amount of 484 percent ad valorem (ad valorem to be determined in accordance with sec. 402 of the Tariff Act of 1930, as amended (19 U.S.C. 1401a)) from the day after this order is received by the President pursuant to section 337(g) of the Tariff Act of 1930, as amended, until such time as the President notifies the Commission that he approves or disapproves this action, but, in any event, not later than 60 days after the date of receipt;

3. That this order be published in the Federal Register and that this order and the opinion in support thereof be served upon each party of record in this investigation and upon the U.S. Department of Health, Education, and Welfare, the U.S. Department of Justice, the Federal Trade Commission, and the Secretary of the Treasury; and

4. That the Commission may amend this order at any time.

By order of the Commission.

Issued: January 10, 1980.

Kenneth R. Mason,

Secretary.

[FR Doc. 80-1443 Filed 1-15-80; 8:45 am]

BILLING CODE 7020-02-M

[1] Those eight respondents are as follows: Celestial Tool Company, Inc.; King Imports, Ltd.; Duo Hung Manufacturing Co.; Eastman Sales Corp.; Bee King Industrial Co., Ltd.; V. Lee Industrial Co., Ltd.; Long Lee Industrial Co.; and Chun Her Machinery Co.

[701-TA-21 (Preliminary)]

Fresh Cut Roses from the Netherlands; Institution of Preliminary Countervailing Duty Investigation and Scheduling of Conference

Investigation instituted. Following receipt of a petition on January 3, 1980, filed on behalf of Roses Incorporated, a trade association of the U.S. rose growing industry, the United States International Trade Commission on January 11, 1980, instituted a preliminary countervailing duty investigation under section 703(a) of the Tariff Act of 1930 to determine whether there is a reasonable indication that an industry in the United States is materially injured, or is threatened with material injury, or the establishment of an industry in the United States is materially retarded, by reason of allegedly subsidized imports from the Netherlands of fresh cut roses, provided for in item 192.18 of the Tariff Schedules of the United States. This investigation will be subject to the provisions of Part 207 of the Commission's *Rules of Practice and Procedure* (19 CFR 207, 44 FR 76457) and, particularly, Subpart B thereof, effective January 1, 1980.

Written Submissions. Any person may submit to the Commission on or before February 5, 1980, a written statement of information pertinent to the subject matter of the investigation. A signed original and nineteen copies of such statements must be submitted.

Any business information which a submitter desires the Commission to treat as confidential shall be submitted separately and each sheet must be clearly marked at the top "Confidential Business Data." Confidential submissions must conform with the

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Exhibit 3

The Secretarial Decision

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United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PETITION TO DESIGNATE CERTAIN FEDERAL LANDS IN SOUTHERN UTAH UNSUITABLE FOR SURFACE COAL MINING OPERATIONS	)	OSM Reference No: 79-5-001

STATEMENT OF REASONS

I. Introduction

On December 16, 1980, in response to a petition filed by the Sierra Club and others, I issued my written decision declaring unsuitable for surface coal mining operations certain Federal lands in the Alton coal field and adjacent to Bryce Canyon National Park in Southern Utah. As noted in that document, I based my decision on all of the information contained in the administrative record of this proceeding. This record includes the final combined petition evaluation and environmental impact statement document and information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, industry and members of the public. This document constitutes the Statement of Reasons underlying my conclusion that mining in the designated areas would cause significant cumulative adverse impacts on Bryce Canyon National Park and supporting my decision to reject all of the petitioners' other claims.

II. Background

This decision is the first made under Section 522 of the Surface Mining Control and Reclamation Act of 1977 (Surface Mining Act), 30 U.S.C. § 1272. Section 522 establishes procedures that enable states

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and the federal government to respond to the conflicts between surface coal mining operations and other uses of land. Section 522 contains two general categories of designation -- statutory designations and designations by petition. Subject to exceptions for valid existing rights and existing operations, mining is statutorily prohibited in certain nationally significant areas (e.g., the National Park System, the National Wildlife Refuge System) and within certain specified distances of dwellings, public buildings, communities and parks and cemeteries. Section 522(e)(1) and (e)(5). Subject to those same exceptions, mining in national forests and near public roads and mining which adversely affects public parks or National Register sites may also be prohibited or limited by the Surface Mining Act. Section 522(e)(2), (e)(3) and (e)(4). Lands within the petition area on which surface coal mining operations are already prohibited under these sections of the statute include Bryce Canyon National Park, the town of Alton and the Alton cemetery.

In addition, Section 522(c) allows any person having an interest which is or may be adversely affected by surface coal mining to petition the regulatory authority to have an area designated unsuitable. The specific procedures for acting on a petition to designate Federal lands appear in Section 522(c) and 30 CFR Part 769. As the regulatory authority for Federal lands (Sections 523 and 701(22)), the Department followed these procedures in acting on the instant petition. See Section III below. The regulatory authority must designate an area unsuitable for all or certain types of surface coal mining operations if the regulatory authority determines that

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reclamation pursuant to the Surface Mining Act is not technologically and economically feasible. Section 522(a)(2); 30 CFR 762.11(a). The regulatory authority has discretion to designate an area unsuitable if mining operations will (1) be incompatible with existing state or local land use programs, (2) affect fragile or historic lands by causing significant damage to important historic, cultural, scientific, and esthetic values and natural systems, (3) affect renewable resource lands by causing a substantial loss or reduction of long-range productivity of water supply, food or fiber products, or (4) affect natural hazard lands so as to endanger life and property. Section 522(a)(3); 30 CFR 762.11(b). The petition in this case (as described in detail below) states that designation is mandatory under Section 522(a)(2) and also requests designation based on the fragile or historic lands and renewable resource lands criteria of Section 522(a)(3)(B) and (C).

The boundaries of the entire petition area enclose approximately 325,200 acres or slightly more than 500 square miles of land in Southern Utah. About 203,900 acres, excluding Bryce Canyon National Park, are in Federal ownership. About 16,300 acres are owned by the State of Utah and 68,600 acres are privately owned. Page I-1 of the Southern Utah Petition Evaluation Document (PED). By law the petition applies only to the Federal lands within the petition area. See map attached as Appendix A; see also Figure IIB8-1 at PED II-12a.

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III. CHRONOLOGY

On November 28, 1979, the Environmental Defense Fund, Friends of the Earth, Sierra Club Legal Defense Fund, Sylvan Johnson, Leon Lippincott, Caroline Lippincott, Jet Mackelprang, Cynthia Myers, Susan Hittson and Larry Little submitted to the Department's Office of Surface Mining Reclamation and Enforcement (OSM), a petition to designate certain Federal lands in southern Utah unsuitable for surface coal mining operations. The petition was found to be complete on December 27, 1979. Notice of receipt of the complete petition was published on January 17, 1980. 45 F.R. 3398. The notice described in detail the lands in the petition area.

On April 24, 1980, OSM published notice of intent to prepare a statement of coal resources, demand for coal, and impact of the designation in accordance with Section 522(d) of the Surface Mining Act, in combination with preparation of an environmental impact statement 45 F.R. 27836. That notice described the major issues derived from the petition and, in addition, gave notice to the public of a scopin meeting to be held on May 6, 1980. At the public meeting, relevant issues to be addressed by the combined statement were raised by citizens.

The Surface Mining Act provides that designation of Federal lan shall be within the exclusive authority of the Secretary of the Inte ior after consultation with the states involved. Section 503(a)(5). Under the Department's regulations implementing the Surface Mining A the OSM Regional Director within whose region the petition area is l cated normally is delegated the authority to issue the final writte

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decision on a petition. 30 CFR 769.18(b). However, by Federal Register notice of May 20, 1980, I announced that I would exercise my retained authority to make the decision in this important and novel proceeding. 45 F.R. 33738.

To aid in preparing the combined petition evaluation and environmental impact statement document, studies of the potential impacts of surface coal mining operation in the petition area, particularly as identified in the petition and at the scoping meeting, were conducted by various federal agencies and contractors. The petitioners and intervenors also conducted studies of potential impacts of such mining. On September 12, 1980, OSM announced the availability to the public of the draft combined petition evaluation and environmental impact statement document. 45 F.R. 60495. That notice summarized available information, including related NEPA reviews, as well as the information generated by the new studies. The notice required comments on the draft document to be received by October 15, 1980, and announced the times and format of the public hearings on the petition, noting that anyone wishing to speak would be given the opportunity to do so.

On September 16, 1980, Utah International, Inc. (UII) and Nevada Electric Investment Company filed with OSM a petition in intervention to the original petition. Each of these companies holds federal coal leases in the Alton coal field and within the petition area. The lands in these leases are hereafter referred to as the Alton leasehold or leasehold. On September 26, 1980, Gary A. Kalpakoff, Joan A. Kalpakoff, Henry Carroll, Norman H. Carroll and East Canyon Irrigation

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Company filed with OSM an intervention petition supporting the original petition. On October 3, 1980, an amended petition was filed that removed the names of Henry Carroll and Norman Carroll.

The public hearings on the petition were held on September 29, 1980, at Kanab, Utah; on September 30, 1980, at Kanab and Panguitch, Utah; and on October 10, 1980, at Kanab. Testimony at the hearings was received by a panel of officials from the Office of the Secretary, OSM, and Office of the Solicitor. Members of the panel asked clarifying questions at the conclusion of witnesses' testimony. Attendance at the hearings totalled nearly 600 persons and 102 witnesses were heard. Witnesses included numerous local citizens, the intervenors, and representatives of various local and Federal agencies and the State of Utah.

On October, 16, 1980, OSM extended the comment period for written comments on two reports. 45 F.R. 68762. The reports, a U.S. Environmental Protection Agency noise study report and a UII air quality report, were not submitted until the October 10, 1980, hearing. Because of the length and detail of the reports, the comment period on the two reports was extended until October 20, 1980.

More than 100 written comments were received during the public comment period. Commenters included industry, environmental groups, citizens, and local, State and Federal agencies. As required by 30 CFR 769.4(a), I have solicited and obtained the views of the appropriate State and local agencies. In addition, I obtained the detailed recommendations of Governor Matheson of Utah. Letter of Scott M. Matheson to Paul Bodenberger, OSM, dated October 14, 1980. All

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substantive comments were considered and the comments and responses to them are included in the final combined petition evaluation and environmental impact statement document.

On November 26, 1980, OSM announced the availability of the final combined petition evaluation and environmental impact statement document. 45 F.R. 78816. The notice described the document itself, as well as the procedure for obtaining copies. The document was pub-published in two volumes: the text, Southern Utah Petition Evaluation Document (PED) and the comments with responses, Southern Utah Petition Evaluation Document - Comments and Responses (PED Comments). The notice also indicated that a decision on the petition would follow shortly. On December 16, 1980, I issued my decision on the petition.

IV. BRYCE CANYON NATIONAL PARK AND DIXIE NATIONAL FOREST ISSUES

A. Allegations of Petitioners and Intervenors

Petitioners alleged, under Section 522(a)(3)(B) of the Surface Mining Act, that surface coal mining operations in the petition area would significantly damage Bryce Canyon National Park, Dixie National Forest and other fragile lands. Specifically, petitioners alleged that:

1. Surface coal mining operations in part of the petition area would cause significant adverse visual impacts on Bryce Canyon Nationa Park. Those impacts would include mining activities, raw and disturbe earth, dust plumes from mining operations and potentially permanent alteration of the vegetation visible from the park (Pet. ¶24);

2. Surface coal mining operations would produce noise and

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industrial odors that would diminish the experiences of visitors to the park (Pet. ¶24);

3. Surface coal mining operations would significantly increase ambient particulate concentrations in the vicinity of the park, which would impair scenic attractions in the park, as well as the vistas from the park (Pet. ¶25);

4. Blasting associated with surface coal mining operations could harm the erosional formations for which Bryce Canyon is famous (Pet. ¶26);

5. Surface coal mining operations would disrupt the park's natural systems and destroy local wildlife habitats (Pet. ¶27);

6. Surface coal mining operations would damage important esthetic and recreational values in Dixie National Forest, including hiking, camping, hunting and fishing; and mining operations would impair vistas and visibility, increase noise and disrupt wildlife habitats of the forest (Pet. ¶¶28-29);

7. Surface coal mining operations would destroy the present diverse vegetation of the petition area and severely disrupt the natural systems of the petition and adjacent areas, irreparably damaging wildlife habitats and the ecological, esthetic and recreational values of the Alton area (Pet. ¶30).

In response, the intervenors who opposed the unsuitability petition contended:

1. Surface coal mining operations would not adversely affect lands within the park or forest and would not adversely affect the ex-experience of visitors to the park or forest. In particular, no

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harmful effects on erosional structures, odor levels, animal migration or habitat, or air quality within the park or forest would result from surface coal mining operations in the petition area (UII Pet. Int. ¶28);

2. Any such adverse impacts that might be found must be balanced against loss of coal supplies and injuries to the local economy that would result from designation of all or part of the petition area as unsuitable for surface coal mining operations (UII Pet. Int. ¶27);

3. The Surface Mining Act contains no authority for the creation of buffer zones around Bryce Canyon National Park in the absence of competent scientific evidence supporting designation of such lands as unsuitable for surface coal mining operations (UII Pet. Int. ¶29).

B. Description of Bryce Canyon National Park

The authorities establishing and enlarging Bryce Canyon National Park explicitly refer to, and direct the preservation of, the scenic values of the park. Presidential Proclamation No. 1665, 43 Stat. 1914 (June 8, 1923); letter to House Committee from the Department of the Interior, incorporated into H.R. Rep. No. 554, 68th Cong., 1st Sess. 2 (1924); Presidential Proclamation No. 1952, 47 Stat. 2455 (May 4, 1931). In addition, the Clean Air Act Amendments of 1977, 42 U.S.C. §§ 7401 et seq., grant the Secretary of the Interior authority and responsibility for protecting the air quality related values of class I Federal areas, which include Bryce Canyon National Park. These values are defined as visibility and those scenic, cultural, biological and recreational resources of a park that are affected by or dependent on air quality. Thus, Bryce Canyon National Park's charter and subsequent legislation require preservation of

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the park for the enjoyment of present and future generations and preservation of the scenic, visibility and air quality resources of the park. See PED I-5 to I-6.

Bryce Canyon National Park comprises approximately 34,715 acres of the petition area. PED II-12. The park receives about 620,000 visitors each year who use the park for sightseeing, hiking, camping, horseback riding and other activities. The park is used throughout the year, though most visits are from May through September. PED II-17.

The park is a Class I attainment area under the Prevention of Significant Deterioration (PSD) increment system of the Clean Air Act Amendments of 1977, which means that very little deterioration of its ambient air quality is allowed. The park has some of the highest visual ranges in the United States. Typically, points as distant as 150 kilometers (93 miles) are visible. PED II-3. Yovimpa Point and the Southern Amphitheater, located in the southern portion of the park, offer vistas including such features as the Kaiparowits Plateau, Navajo Mountain, the Kaibab Plateau, the Coral Pink Sandunes, the Kanab Canyon system and the Grand Staircase. Also, about 2,000 acres of the Alton leasehold are visible from Yovimpa Point, extending 5 to 11 miles from the Point. PED II-4.

Measurements by EPA have indicated that background sound levels at Bryce Canyon National Park are comparable to those in a high-qualit sound studio. The park is the quietest area yet measured in EPA's Region VIII. PED II-17. In some areas, the background noise levels

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are below the level of detection of current sound recording instruments. PED II-18.

Bryce Canyon is famous for its exceptional erosional features. Its bedrock is characterized by a complex system of "master" joints and differences in erodibility among rock layers. These have resulted in the formation of the fantastic walls and pinnacles (also called "hoodoos") for which the park is reknowned. PED II-10.

The most common wildlife species in the petition area are mule deer, cottontail rabbit, mourning dove, blue grouse, cougar, wild turkey, band-tailed pigeon, beaver, pronghorn antelope and sage grouse. A variety of other large and small mammals inhabit the area. PED II-1 The Utah prairie dog, which is protected under the Endangered Species Act of 1973, 16 U.S.C. §1361, inhabits a small area in the northwester corner of the petition area. Bald and golden eagles, protected under the Bald Eagle Protection Act, 16 U.S.C. §668, also may be found in the petition area. Certain migratory bird species, protected under the Migratory Bird Treaty Act, 16 U.S.C. §703, inhabit the forests within the petition area. PED II-16.

The southern and northern portions of the petition area have bee surveyed for wildlife values. The southern portion is characterized by high-priority and, in the Dixie National Forest, critical wildlife values. The northern portion exhibits mostly substantial or limited wildlife values. In addition, deer summer and winter ranges are located within the petition area. While deer herds tend to move from summer to winter range along creek bottoms through the petition area, the petition area contains no mass migration corridors. PED II-15.

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The East Fork Virgin River has limited fishery values, but is classified as sportfish waters. This river flows into the Virgin River, which is of critical value to the woodfin minnow, a federall listed endangered species. The Virgin River roundtail chub, which being considered for listing as an endangered species, and the Virg River spinedace, which the Utah Department of Wildlife Resources considers a declining species, also are present in the Virgin River. PED 11-16.

C. Findings

My findings that relate to impacts on Bryce Canyon National Pa and the Dixie National Forest are based upon consideration of the full administrative record of this proceeding. This record include the PED, as well as information provided by the petitioners, intervenors, Federal agencies, the State of Utah, local agencies, indust and members of the public in the form of petitions, materials submitted for the record, testimony at the public hearings, and all written comments received up to the close of the comment period on October 20, 1980.

1. Air Quality

The record does not support petitioners' allegation that particulate concentrations in the park's air would increase by as much as 29 ug/m^3. Pet. Ex. 4, ¶6. The record on air quality impacts cons primarily of three studies. Analyses of the probable air quality impacts of mining the petition area were prepared by EPA Region VIII OSM, by Environmental Research and Technology, Inc. (ERT) for UII the Sierra Club Legal Defense Fund. The EPA and ERT studies were

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based on information supplied by UII concerning its proposed methods for mining its leasehold.

EPA Class I and Class II PSD increments for fugitive dust emissions were utilized in the PED as a device for comparing the results of these studies. In response to the invalidation of EPA's prior fugitive dust PSD regulations in Alabama Power Company v. Costle, 602 F.2d 1068 (D.C. Cir. 1979), EPA has exempted surface coal mining operations as sources of fugitive dust emissions for PSD purposes. 45 F.R. 52675 (August 7, 1980). Accordingly, the PSD increments for Class I and Class II areas were utilized only as references; they have not been used to determine whether surface coal mining in the petition area might result in violations of these incremental standards.

The EPA study (discussed at PED III-2 to III-4) yielded predictions for 1994, the year of maximum mining activity, and 2014 when mining would be closest to the park. The EPA study predicted that annual total suspended particulate (TSP) concentrations in the park would not exceed 5 ug/m^3, the Class I annual PSD increment. PED figures IIIB1-2 and IIIB1-3 at PED III-4a and III-4b. The study did show that 24-hour particulate concentrations might exceed the 24-hour Class I PSD standard on 1 or 2 days per year in the southeast corner of the park. PED III-3 to III-4.

The ERT study (discussed at PED III-4 to III-5; see also PED Comments at 390-393 (comments of UII)) utilized the same emission rates, particle size distributions, control efficiencies and meteorological data used in the EPA study, but employed a different diffusion

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modeling approach. The particulate concentrations resulting from the ERT study were below both the annual and 24-hour Class I increments. PED Table IIB1-3 at PED III-6a.

The study conducted by the Sierra Club used different modeling assumptions than were used in the EPA and ERT studies. PED III-5. Th Sierra Club concluded that the 24-hour Class I increments would be exceeded by mining near the park. PED Table IIIB1-4 at PED III-6a. However, the Sierra Club modeling (1) did not consider mining operations other than dragline operations, (2) assumed a mining rate three times that planned by UII in the eastern part of the Alton leasehold, (3) assumed that mining would occur within 5 km of the park although 7 km is a more realistic distance, and (4) used a dragline emission rate that is higher than the rate used by EPA. Corrections for these factors would tend to reduce the 24-hour concentrations to near the Class I increment level. PED III-5.

Based on these studies and the PED, I find that (1) the annual average TSP concentrations in the park would not exceed the Class I annual PSD increments and (2) the 24-hour Class I PSD increments would be exceeded in the park only rarely and only in one area. I find that these small increases in particulate concentrations do not in themselves constitute a basis for an unsuitability determination.

2. Visibility

The petition alleges that increased ambient particulate concentrations caused by surface coal mining operations in the petition are would impair visibility in the park and reduce visual ranges from viewpoints in the park. As explained below, the record demonstrates

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that mining in the petition area would lead to impairment of visibility, particularly with respect to views from the park in the direction of active mining operations near the park.

Three visibility studies were conducted with respect to potential mining of the petition area. Each of these studies focused on impacts to the south-facing scenic overlooks of the park, especially Yovimpa Point. Yovimpa Point is the developed scenic overlook from which mining activities would primarily be visible. The study conducted by Systems Applications, Inc. (SAI) for EPA (discussed at PED III-6 to III-7) indicated a strong possibility of perceptible, localized impairment of the view from Yovimpa Point caused primarily by dust plumes resulting from mining activities. Because of the transient nature of the dust plumes, however, the photo analyses of the potential visual impact of mining on the view from Yovimpa Point that were enclosed in the PED do not reproduce the visual effects of dust plumes. PED Comments at 121 (OSM response to comments of Environmental Defense Fund). The SAI study showed that plumes would be perceptible as whitish-gray clouds or large layers that would be visible against the darker tree-covered background of the view from Yovimpa Point. The largest and most visible plumes would occur infrequently and usually during the early morning, but plumes would be visible near mining operations two-thirds of the daylight hours. SAI concluded that the plumes would reduce visual ranges in the direction of the plumes. PED III-6 to III-7 and Figure IIIB2-1 at PED III-6b. The light and moderate winds characteristic of the petition area would contribute to frequent reductions of visual range. PED III-7.

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SAI predicted insignificant increases in regional haze as opposed to localized plumes. PED III-7. This prediction was corroborated by the ERT study performed for UII, which concluded that, under worst case conditions, regional haze would noticeably reduce visual ranges in the direction of mined areas only 1 percent of the time. PED III-7. This conclusion is consistent with the SAI prediction of visual reductions in the direction of plumes because the SAI study focused on the visual impact of plumes, while the ERT study was concerned with regional visibility. PED Comments at 358-359 (comments of Sierra Club and Friends of the Earth) and 394-395 (comments of UII).

A Sierra Club study evaluated the visibility impact of a single dragline. Using two different assumed particle size distributions, the study predicted visual range reductions from the dragline operation. PED III-7. However, the accuracy of the particle size distribution which formed the basis for the larger visual range reduction was not adequately demonstrated. Insufficient information was provided to confirm that the downwind monitors used in the separate study which derived the distribution were placed so as to record representative particle size distributions or that the distribution was representative of typical emissions from a dragline. PED III-7; see PED Comments at 357-358 and 361-362 (comments of Sierra Club and Friends of the Earth) and 157-158 (comments of ERT). The Sierra Club study did show that dust plumes created by a dragline would be dense enough so that viewers from the park would see opaque plumes near the plume point of origin, thus obscuring the view beyond the plumes. PED III-8.

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Based upon these three studies, I find that the park's visibilit would be impaired by surface coal mining operations in the petition area. Some reduction in visual range from the park to the south is likely. Plumes resulting from surface coal mining would reduce visua range in the directions of the dust plumes created by mining. Therefore, I have concluded that surface coal mining operations whose plum would be visible from the park, especially from mining operations eas and south of the park, would have severe impacts on visibility from t park.

3. Visual Resources

The record demonstrates that surface coal mining operations in the portions of the petition area nearest Bryce Canyon National Park would adversely impact the significant visual resources of the Park a well as its visibility. Visibility refers to the clarity and visual range of the views in and from the park, whereas visual resources ar the scenic objects, such as the Grand Staircase, Kaiparowits Plateau Navajo Mountain, and the relatively unspoiled scenery visible in and around the park. Adverse impacts on visibility include reductions i clarity and visual range; adverse impacts on visual resources includ visible uncharacteristic activities that are visible from the park and obstruction of scenic objects.

The record shows that surface coal mining operations in the eas ern part of the Alton leasehold, due south of the park, would result in approximately 25 years of visual intrusion upon the visual resour of the park. Blasting and operation of heavy mining equipment would generate dust plumes in this area that would be visible from Yovimpa

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Point and other south-facing park overlooks. PED III-11. During mining in the eastern part of the Alton leasehold, visibility from Yovimpa Point could be reduced so that portions of the landscape from five to fifteen miles from Yovimpa Point could be obscured by plume blight (visible emissions traceable to the source of the plume). PED III-11 to III-12; see also visibility finding above.

Much of the eastern portion of the Alton leasehold is visible from Yovimpa Point. See Figure IIB3-1 at PED II-4a. In addition, other vista points in the park overlook potentially surface mineable areas outside the Alton leasehold east and south of the park. PED III-12. Surface coal mining activities in any of these areas, particularly dragline operations, would be visible to park visitors using these overlooks until mining activities in each area are terminated. PED III-9 and III-12. Moreover, for some years following commencement of reclamation operations, viewers would be able to perceive differences in landscape color and texture and see that these areas had been altered, although, this effect would lessen over time as the reclaimed areas become fully revegetated. PED III-12 to III-13. Thus, I find that there will be adverse visual impacts on the park and its esthetic values if portions of the petition area, as described in paragraph 1 of my decision, are ever mined and that surface coal mining operations would adversely affect those areas because they are fragile lands, as defined in 30 CFR 762.5

4. National Park Services Visitor Survey.

The National Park Service (NPS) conducted a survey at Bryce Canyon National Park from mid-June to mid-September, 1980. The survey

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was designed to determine: (1) why visitors go to Bryce Canyon National Park; (2) what visitors perceive as the important values of the park; and (3) how visitor enjoyment of the values might be affected by surface coal mining operations near the park. The methodology and results of the visitor survey are described in the PED at III-8 to III-11, V-2 through V-20, and in the NPS report of September, 1980 entitled Results of the NPS Visitor Survey Conducted at Bryce Canyon National Park - Summer 1980.

The survey received heavy criticism during the comment period, mostly from UII. In particular, K.L. Berry, a social psychologist hired by UII to analyze the survey, presented extensive comments. NPS responded to these criticisms. The specific criticisms and responses appear in the PED Comments at 405, 452-470, 673-680 (comments of UII including K.L. Berry and Frank K. Vance); 38-39 (comments of NPS); 65-66 (comments of the State of Utah); and 79-80 (comments of Garfield County Commission).

These critics did not dispute, however, that hundreds of thousands of people do visit Yovimpa Point and other points overlooking potentially mineable areas in the petition area. Nor did they dispute that views of surface coal mining operations in the eastern Alton leasehold would have adverse impacts on many visitors. I have treated the NPS survey as a source of broad trends but have not relied on it for specific numbers. PED Comments at 405 (response of NPS to comments of UII). These trends identified by the survey are as follows: park visitors value clean (fresh) air, scenic views, rock formations and solitude; and degradation of these values would decrease their

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enjoyment of visits to the park and reduce their time spent in the park. Thus, the survey confirms my finding that surface coal mining operations in the designated portions of the Alton leasehold would ha an adverse impact on the experiences of visitors to Bryce Canyon Nati al Park and result in significant damage to the esthetic values of th park and surrounding area, especially the extraordinary scenic qualit

5. Fish and Wildlife Resources

Petitioners' allegation regarding the destruction of wildlife and wildlife habitats by surface coal mining operations in the petition area are not supported by the administrative record. A number of potential impacts were presented by petitioners or discussed in the PED, but none will result in irretrievable destruction of wildlif resources. There are generally two types of impacts on wildlife and fish: those resulting directly from the mining operations and those resulting from reclamation after the mining operations have terminate

Four direct impacts of mining were identified by petitioners and the PED:

1) Destruction of wildlife due to general human activity (PED III-35);

2) Loss of habitat, and thus destruction of wildlife, due to the presence of mining operations (PED III-34);

3) Destruction of wildlife due to loss of water resources (Pet. ¶14); and

4) Destruction of wildlife due to the disruption of migration patterns (Pet. ¶27).

The PED indicates that, while reduced populations will result from increased human activity in the area and from the loss of habita no adverse long-term impact is anticipated. PED III-26. The annual

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disturbance resulting from mining operations would be limited and temporary because the area would be mined in blocks and reclamation would occur concurrently. Ibid.; see also PED Comments at 21 (state ment of District Manager, BLM Cedar City, Utah, District Office). I is therefore doubtful that increased activity or loss of habitat wil cause sufficient destruction of wildlife to support a finding of un- suitability.

The effect of surface coal mining operations on water resource: in the petition area is discussed in detail in Section V B of this Statement. Depletion of the flow in the East Fork Virgin River by pumping ground water from the Navajo Sandstone aquifer might advers affect endangered and other species in the Virgin River (the woodfi minnow, Virgin River roundtail chub and Virgin River spinedace). P III-35. Available data are not sufficient, however, to determine t extent of the adverse impact on wildlife that might result from pum water from the Navajo aquifer. PED III-36; Section V B 4 below. N are there sufficient data to support a finding of unsuitability bec of adverse impacts on wildlife. Any future specific proposals to c duct surface coal mining operations in the Alton leasehold will be viewed in compliance with Section 7 of the Endangered Species Act U.S.C. § 1536) in order to determine potential adverse effects of ing on fish and wildlife. See, e.g., 30 CFR 779.20, 780.16 and 81

I also find that the surface coal mining operations will not rupt migration patterns for the mule deer from summer to winter ra Although major movements of deer occur within the petiton area, no migration corridors can be identified. The winter range south of

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Alton leasehold is sufficiently widespread to permit the deer to circ vent any mining operations. PED III-35; see also PED Comments at 21 (comments of UII). Furthermore, the Utah Big Game Range Inventory in cates that deer which summer in Bryce Canyon usually winter in the Sevier and Virgin River drainages rather than south of the coal field PED III-35.

Two potential wildlife impacts after mining were identified by petitioners:

1) Non-native plant species introduced in the revegetation efforts will invade the park and alter the natural plant communities within the park (Pet. ¶27); and

2) Revegetation will destroy the diverse vegetative mosaic of the area (Pet. ¶30).

Non-native plant species may be used to revegetate the mined areas. PED III-25. However, the Department's regulations already contain stringent requirements to ensure that introduced plant specie do not interfere with natural systems. 30 CFR 816.111 and 816.112. addition, non-native species have been introduced by BLM in close proximity to the park and there is no indication that these species invading the park despite their close proximity to it. PED III-25 t III-26; see also PED comments at 20-21 (statement of BLM District Ma ager).

The PED indicates that, rather than destroying the current vege tative diversity, revegetation will increase it and provide for im proved forage. PED III-29 to III-30. The creation of open-spaces w provide a diversity of foods not currently available to the wildlife

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community. The creation of a maximum "edge" (the border between wooded and non-wooded areas) will particularly benefit the summer range of the mule deer. Moreover, a variety of predators would also be benefited by the increase in open space. PED III-34 to III-35; see also PED Comments at 60-61 (comments of the State of Utah). Thus, I have concluded that reclamation after mining will not adversely affect wildlife.

In summary, I find that the administrative record does not substantiate the petitoners' allegations that wildlife in the petition area will be adversely impacted by surface coal mining operations.

6. Impact on Hoodoos.

Petitioners allege that surface coal mining operations in the petition area would threaten the delicate erosional formations and unique vertical features, known as "hoodoos," that are located within Bryce Canyon National Park. (Pet. ¶¶23 and 26). In particular, petitioners claim that "vibrations from blasting operations could be transmitted directly to these formations, causing their destruction." (Pet. ¶26). Studies performed to determine the validity of these statements, however, indicate that blasting from mining operations will have no adverse impact on the park's erosional formations.

In support of their claims, petitioners cite a letter dated November 28, 1979, from Glen Bean, Regional Director of the National Park Service, Rocky Mountain Region, to the Sierra Club Legal Defense Fund and the Environmental Defense Fund. In his letter, Mr. Bean speculated that "[t]he delicately carved limestone spires are indeed fragile; blasting, as a part of the mining operations, may cause

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seismic waves and air overpressure which could damage rock formations inside the Park." (Pet. Ex. 3) (emphasis added).

As further noted by Mr. Bean in his letter, OSM and NPS conducted a study designed to predict the effects of blasting on the hoodoos. The methodology used in the study is described in the PED in Chapter V, Section C. The techniques employed in the study are described as representing the state-of-the art. PED V-21 to V-26. The results of this investigation are summarized in the PED: "[V]ibration associated with blasting from the proposed Alton mine will have no adverse impact on the erosional forms of the Bryce Canyon National Park or Dixie National Forest." PED III-32; see also 9/29-30/80 Tr. at 110 (statement of James Thompson, NPS). The record contains no other evidence supporting petitioners' claims and includes another study which supports the conclusion that blasting will not adversely affect the hoodoos. L. L. Obriand examined this potential problem for UII and concluded that "the proposed blasting operations will have no detrimental effect on the erosional features of Bryce Canyon National Park." PED Comments at 227, 231 and 236-243 (statement of L. L. Obriand). I therefore conclude that blasting from mining operations will not harm the hoodoos.

7. Noise

The petition alleges that surface coal mining operations in the Alton leasehold and other petition areas near Bryce Canyon National Park would adversely impact the experiences of visitors to the park due to noise from mining machinery and blasting. Pet. ¶24. The park currently is one of the quietest places in the United States, with

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background noise levels in some areas that are undetectable by sound recording instruments. PED II-17 to II-18. Because Bryce Canyon National Park is extremely quiet, noise intrusion from sources external to the park will be particularly noticeable to visitors in the park. PED II-18 to II-19.

The 170-ton trucks and scrapers used in surface mining will be the principal equipment that produces noise. Truck noise from surface mining activities in the Alton leasehold alone can be expected to increase significantly the nocturnal sound levels at Yovimpa Point and other areas of the park during summer months. PED Figures IIIB11-1 and IIIB11-2 at PED III-38b and III-38c. Even at the farthest point in the Alton leasehold which is visible from Yovimpa Point, trucks will be distinctly audible throughout the park 10 percent of the time in the early morning hours. PED III-37; Figure IIIB11-2 at PED III-38c. During the daytime in the summer, truck noise from mining operations in the portion of the Alton leasehold nearest to the park will be perceptible throughout much of the park. PED III-37; Figure IIIB11-3 at PED III-38d. Truck noise from daytime summer operations at the farthest point in the Alton leasehold visible from Yovimpa Point would be audible mainly by persons on trails south of Yovimpa Point. PED III-38; Figure IIIB11-4 at PED III-38e. Truck noise from mining operations east of the park in the vicinity of Horse Mountain, Willis Creek and Sheep Creek will have a greater impact on the park than would operations anywhere in the Alton leasehold. PED III-39; Figure IIIB11-7 at PED III-40d.

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Truck noise generated in the western portion of the Alton leasehold will have a less significant impact due to greater distances fro the park and the intervening topographical barriers. PED III-38 to III-39. Thus, truck noise from mining operations in the area of the Alton leasehold farthest from the park would be distinctly audible in the southwestern part of the park during summer only 10 percent of th time in the early morning. Figure IIIB11-5 at PED III-40b. That noise would be marginally perceptible in the southwestern part of the park during the evening 50 percent of the time. PED III-39; Figure IIIB11-6 at PED III-40c.

Blasting is the other major source of noise associated with surface mining that would affect the park. The methodology utilized by OSM in the prediction of blasting noise impact on the park is described at PED III-39 to III-40. The analysis addressed the three types of blasting used in surface mining; they are, in order of loudness, parting blasting, coal blasting and overburden blasting.

Because blasting noise travels over long distances, the effect of atmospheric absorption must be considered in determining noise levels. In particular, the effect of winds in increasing or decreasing blasting noise impact on the park was considered. The results of OSM's analysis of blasting noise impact on the park during the summer months are found in PED Tables IIIB11-2 through IIIB11-8 at PED III-4 III-40e and III-42a and Figure IIIBII-8 at PED III-40f.

The Committee on Hearing, Biacoustics, and Biomechanics of the National Research Council (PED III-40), has issued recommended criter for assessing noise impacts on critical use areas such as national

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parks. Based on its criteria, surface mine blasting noise generated anywhere in the Alton leasehold would create significant adverse impacts in the park during summer months whenever 10 m.p.h. winds blow from the Alton leasehold toward the park, which is a characteristic condition. PED III-40 to III-41. When winds are not blowing or blow from the park towards the leasehold, as occurs during early evening, only blasting noise from the eastern portion of the leasehold would adversely impact the entire park. PED III-40. Blasting noise from the western portion of the leasehold would not significantly impact high use areas of the park, except that parting blasting noise would adversely impact trails and campsites throughout the park. PED III-40.

In summary, OSM's analysis of expected truck and blasting noise indicates that surface coal mining operations in the eastern portion the Alton leasehold can be expected to cause significant adverse nois impacts on the park. Mining east of the park would have an even more severe adverse impact on the park. However, truck noise from mining in the western portion of the Alton leasehold would seldom adversely affect visitors to the park. Blasting noise from the western portion of the Alton leasehold would not usually have an adverse impact on high use areas of the park, although parting blasting noise from this area would adversely affect trails and campsites in the park. I therefore conclude that surface coal mining operations in the portions of the petition area south and east of the park, including the eastern portion of the Alton leasehold, would significantly damage the exceptional sound qualities of the park. I also conclude that noise from mining operations in the petition area to the west of the eastern

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portion of the Alton leasehold would not significantly damage the sour qualities of the park.

8. Dixie National Forest.

The U.S. Forest Service manages an estimated 57,200 acres within the boundaries of the petition area known as the Dixie National Forest PED II-12. Petitioners allege (Pet. ¶28) that "surface coal mining op erations would also damage important aesthetic and recreational values in Dixie National Forest which include hiking, camping, hunting, and fishing." They allege that mining activities would impair visibility and air quality values and diminish the recreational value of the forest lands. (Pet. ¶29). UII claims that petitioners have not adequately supported their claims regarding impacts on forest lands. PED Comments at 429 (comments of UII). The Forest Service recommended rejection of the petition as it related to National Forest System lands. Letter from Regional Forester, U.S. Forest Service, to Region Director, OSM, Denver, dated October 21, 1980.

The Department's studies show that proposed mining activities would adversely affect the recreational and visual resources of the Dixie National Forest. PED III-4, III-33, III-36, and III-39. Moreover, because Dixie National Forest and Bryce Canyon National Park are contiguous within the petition area (see PED Figure IIIB8-1 at II-12a), the adverse impacts of mining on the park, as discussed abov are equally applicable to the forest. For the reasons stated above, therefore must designate the Dixie National Forest lands within the petition area which are contiguous to the park as described in paragraph 1 of my decision. This designation does not apply, however, to

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portions of the forest within the petition area and west of R. 4W, nor to portions of the forest outside the petition area. In T. 36S, R. 2W, underground mining operations may be allowable, subject to the requirements of Section 522(e)(2) of the Surface Mining Act.

Conclusion

All of the evidence before me, including comments, hearing testimony, the PED and other materials, demonstrates that surface coal mining operations in most areas east and south of the park, including the eastern portion of the Alton leasehold, will adversely impact the visibility, visual resources and noise levels of Bryce Canyon National Park. The park now possesses exceptionally clean air and offers views characterized by their high visual range and unique, interesting features. In addition, the park is one of the quietest places in the United States.

For these and all of the above-stated reasons, I find that coal mining by surface methods, and coal mining by underground methods, where the surface impacts would be visible from Bryce Canyon National Park, on Federal lands in townships T. 40S, R. 4W; T. 39S, R. 4W; T. R. 3W; T. 37S, R. 4W; T. 37S, R. 3W; and T. 36S, R. 3W, of the Salt Lake Meridian, would significantly damage the values for which Bryce Canyon National Park was created. Designation of this area affects Federal coal leases U 0115938, U 0122582, U 0122623, U 0122647, U 012 U 0122650, U 0122651, U 0122652, U 0124768, U 0126916, U 0149582, and part of U 098774, all held by UII. I also find that coal mining by surface methods on Federal lands in townships T. 36S, R. 2W, of the S Lake Meridian, would significantly damage the values for which Bryce

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Canyon National Park was created. Designation of this area affects Federal coal lease SL 071561, held by Caesar Fulton.

I reject, however, all of petitioners' allegations relating to impacts on the air quality, fish and wildlife and erosional forms of Bryce Canyon National Park. In Section V below, I explain my reasons for rejecting petitioners' other claims that do not relate to alleged damage to the park.

V. OTHER REJECTED PETITION CLAIMS

As stated in paragraph 4 of my decision of December 16, 1980, I have rejected some of petitioners' claims. These claims are as follows: (1) the lands within the petition area cannot be reclaimed as required by the Surface Mining Act (Pet. ¶¶2, 3, 11-20); (2) surface coal mining operations could affect renewable resources resulting in a substantial loss or reduction of long-range productivity of water supply, food or fiber products (Pet. ¶¶2, 3, 31-34); and (3) alternative energy sources to the Allen-Warner Valley Energy System, such as conservation, solar, cogeneration, geothermal, wind and hydropower, could provide more energy with fewer environmental and economic costs (Pet. ¶¶4, 35-38).

A. Reclamation of Lands Within the Petition Area.

Petitioners stated that these lands "could not be reclaimed after surface coal mining operations" (Pet. ¶2). As a result, petitioners alleged that I must designate these areas as unsuitable under Section 522(a)(2) of the Surface Mining Act and 30 CFR 762.11(a).

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Petitioners contended that revegetation of the petition area after surface coal mining operations will be impossible or highly unlikely. They attacked the numerous studies and other evidence of revegetation success in the petition area as not representative of the soils and other conditions (topography, size of disturbed area, climatological information) that will be present after the proposed mining Petitioners also stated that successful revegetation will not occur because of lack of topsoil, lack of suitable overburden and adverse climatological factors. The Forest Service, Bureau of Land Managemer (BLM), and intervenors vigorously defended the methodology and conclusions of the studies. Utah believed that reclamation is not only possible, but would enhance the wildlife and grazing capabilities of the area.

1. Studies of Soils and Revegetation.

None of the land within the petition area has ever been disturbed by large scale surface coal mining operations. PED III-26. Numerous studies of the soils and the potential for revegetation of the petition area have been conducted. These studies include the Energy Mineral Rehabilitation Inventory and Analysis (EMRIA) evaluatio (a cooperative study by the BLM, Bureau of Reclamation and Geologica Survey), revegetation studies by Dr. Neil Frischknecht and Robert Ferguson (U.S. Forest Service), in cooperation with BLM and UII, and and soils studies by BLM, UII and the NUS Corporation. Revegetation data have also been developed from chained and/or plowed areas. The areas are Alton, Black Rock, Deer Springs, Swallow Park and First Point. Removal of existing vegetation by chaining, spraying or plow

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is a common practice used to improve the utility of the land for grazing. PED III-24. Climatological information was gathered by the Geological Survey and UII.

Petitioners and other commenters objected to the use of these data stating that the soils in the areas studied are flat, well-drained rich, sandy loams ideally suited for plant growth. In contrast, they stated, the areas that will be mined are steep and stony and the reconstructed soils in these areas will be a poor medium for growth. In addition, petitioners claimed that management practices such as chaining do not disturb the natural soils as do the earth-moving operations associated with mining. Petitioners also claimed that many of the areas studied by the Forest Service and BLM are too small to produce the representative data necessary to study the potential for reclamation.

Although the studies did not precisely simulate the conditions associated with mining, revegetation has been successful in large area of surface disturbance (chaining) and in the smaller plots where soil movement and redistribution were used to simulate major surface disturbances. PED III-26. In addition, the studies have shown that chemical and physical characteristics of soils in the EMRIA study area are very similar to the major soils found in the Alton area. PED III-26 and Table IIIB6-7 at PED III-26b. Significant vegetative cover was established in all of the areas studied. In the majority of areas studied, the vegetative cover either exceeded or was not significantly different from the major plant communities existing within the petition area. PED III-24 and III-25. The methodology for determining

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vegetative cover is described in the PED, Chapter V, Part B. Petitioners' statements regarding potential insect infestation and slow growth rates are not substantiated. PED III-24 and III-25.

As stated in the PED, it is appropriate to extrapolate from these studies in order to determine whether revegetation after mining is feasible. PED Comments at 588-590 (response to comments of Robert Curry). Based upon the numerous studies, the variety of study conditions and the fact that no vegetation type conversions have failed within the petition area during the past 20 years, I conclude that petitioners' contentions on this issue must be rejected.

2. Topsoil.

Petitioners claimed that insufficient topsoil exists in the petition area to support successful revegetation and that the physical and chemical characteristics of the overburden (including sodium content and lack of nutrients) will inhibit plant growth. As noted above, a large amount of information about the soils in the petition area can be used to evaluate this contention. Even assuming disturbance of all 16,747 acres containing surface strippable coal (PED III-27), the studies show that sufficient "good" and "fair" material is available for replacement on the stripped area to a depth of six inches and sufficient "poor" material is available for replacement to a depth of 23 inches. The characteristics of the "good," "fair," and "poor" categories of reconstructed soils for drastically disturbed areas are shown on Table IIIB6-10 at PED III-28d. This estimate of about 30 inches for the total depth of suitable plant growth material is further substantiated by UII's study which shows that 22

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to 37 inches of suitable material is available for reclamation. Western Ecological Services Co., July 1980, PED VIII-12; see also PED Comments at 420 (comment of UII). These depths may be increased with the use of approved overburden materials as a supplement to or substitute for topsoil. 30 CFR 816.22(e).

Petitioners also claim that topsoil stored in piles during mining operations is subject to some erosion and degradation of biological activity. Current regulations, however, require that temporary topsoil piles be protected from erosion and contaminants. 30 CFR 816.23; PED III-28. Petitioners' allegation that topsoil suffers biological degradation when stored for long periods is not supported by current dat PED III-28. I therefore conclude that the petition area contains sufficient topsoil that is suitable for plant growth to support successfu revegetation of surface mined areas.

3. Overburden.

Three studies, the EMRIA report cited above, the SWA report prepared for UII, and a study of 18 drill holes performed by UII, have demonstrated that suitable overburden for reclamation exists in the petition area. PED III-28. Estimates of the depth of suitable plant growth material in the petition area ranged from 15 to 298 feet. PED III-28. These studies, however, do substantiate petitioners' claims that the overburden has a high sodium content. The effects of a high sodium content (measured as sodium absorption ratio--SAR) are detailed in Dr. Coats' affidavit, Pet. Ex. 2 ¶¶10-11. The problems of sodic overburden can be controlled, however, by burial under topsoil and better quality overburden. Burial with four feet of good quality

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overburden or comparable treatment is required by applicable regulations. 30 CFR 816.103; PED III-29. Such burial or treatment should suffice because studies show that burial with far less good quality topsoil (only 5 cm.) can substantially reduce sodic damage. While upward movement of sodium may occur over time, research suggests that proper burial mitigates the effects of this migration. PED III-29. Dr. Frischknecht has found no increase in sodium in four years of testing soil samples. Tr. 9/29-30/80, p. 89.

Accordingly, I conclude that suitable overburden for reclamation exists in the petition area.

4. Vegetation Diversity.

Petitioners claimed that non-native species should not be permitted to spread to Bryce Canyon National Park and interfere with the park's natural systems. Pet. Ex. 2 ¶26. They also argued that any attempted reclamation will be lacking in vegetation diversity. Pet. Ex. 2 ¶27.

Revegetation with native species is required by the Surface Mining Act, although introduced species may be used if it is shown that they will not interfere with natural systems. 30 U.S.C. § 1265(b)(19 Non-native species have been introduced in the study areas close to Bryce Canyon National Park. These species of plants have not been shown to be a threat to the park. PED III-26.

Specific diversity tests on the vegetation in the petition area were conducted by OSM. Tabulated results appear in Tables IIIB6-11, IIIB6-12, and IIIB6-13 at PED III-29 to III-30. These studies indicate that the vegetation communities are generally more evenly dis-

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tributed within the areas that have been revegetated than in the existing communities of the petition area. PED III-30. It is significant that this distribution occurred even though the revegetated portions of the study area were planted with seed mixtures containing onl one or two species. PED Comments at 419 (comments of UII). Seed mix design will be critical to the achievement of postmining vegetation diversity requirements; however, numerous different species have been successfully established on experimental plots within the petition area. Table IIIB6-14 at PED III-30b.

I therefore reject petitioners' claims that non-native species should not be used in revegetation and that revegetation would result in a lack of vegetation diversity.

5. Climate.

Petitioners stated that the climatic conditions in the area also would impede revegetation because large storms common to the area woul increase erosion and replacement of forest cover with alternating area of grassland and bare soils would cause changes in climate ("dessication"). Pet. ¶18. Variability in precipitation and evaporation make irrigation essential for plant growth but an adequate supply of suitable water for irrigation is not present. The available water is of poor quality and its use would aggravate the sodium and erosion problems associated with reconstructed soils. Pet.¶19.

Severe spring thunderstorms, accompanied by high winds, and less severe summer convective storms occur in the petition area. Such storms can cause significant damage, including erosion. PED II-2,

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III-32. Furthermore, the drying or "dessication" effect caused by the increased surface temperatures of disturbed soils and wind may be enhanced when the predominant pinyon-juniper community is removed. PED III-32. However, substantial surface acreage within the petition area has been disturbed and successfully revegetated. These revegetation successes have occurred over long periods of time (10-20 years) and on plots of land ranging from 2,000 to 3,300 acres, surface disturbances which far exceed the annual disturbance of potential mining operations assumed in the Department's analysis. PED II-9, III-32. Furthermore, these areas have been successfully revegetated under a variety of weather conditions and no large scale revegetation failures have been reported or observed. PED II-32; PED Comments at 600-601 (response to testimony of Robert Curry).

Petitioners' claim that disturbed areas will have to be irrigated is also refuted by the available evidence. The annual precipitation characteristic of this area (PED II-2, III-27 and Table IIIB6 at PED III-28c) is apparently sufficient for revegetation since large disturbed areas in this region have been successfully reseeded without the aid of irrigation. PED III-31. Petitioners and other commenters characterize the precipitation of the last four years (when the studies were conducted) as atypical. PED Comments at 324 (comments of Sierra Club Legal Defense Fund) and 601 (testimony of Robert Curry). They suggest that more representative data is available in sources analyzing the historical weather conditions in the region and in Utah. Ibid. The Department has relied on site-specific data obtained from the

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surrounding areas rather than "precipitation data extrapolated from r gional or State averages." PED Comments at 599 (response to testimon of Robert Curry). These precipitation measurements, together with 20 years of success on chained areas and experimental plots without the aid of irrigation, demonstrate that vegetation can be established on disturbed soils in this area under natural weather conditions. I therefore find that petitioners have not shown that climatic conditions will be an insurmountable barrier to successful revegetation of disturbed soils in the petition area.

B. Hydrologic Balance.

Petitioners claimed that surface coal mining operations in the petition area would irreparably harm the hydrologic balance and water quality and quantity both within and without the petition area. Pet. ¶¶12-15. Such operations allegedly would destroy and permanently alt aquifers and associated springs (including the Navajo Sandstone aquifer) which are the principal sources of water for many important land uses in the area. Pet. ¶13. Agricultural activity would be adversely affected because the essential hydrologic functions of alluvial valley floors would be altered and damaged. Pet. ¶15. The erosion, flooding and sediment caused by mining operations and aggravated by revegetation failures would adversely affect streams in the area and result in loss of pasture and cropland. Pet. ¶15.

The quality and quantity of water is a major concern in the State of Utah and is of special concern in the petition area. Springs and wells in the area are important sources of water for agricultural, livestock and other uses. PED II-5 to II-6. The

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major ground water resource in the petition area is the Navajo sandstone aquifer, an aquifer of good chemical quality. PED II-7 to II-8. While the Department's studies suggest that mining operations may alter the hydrologic balance in and around the petition area, uncertain, insufficient and conflicting data concerning the hydrologic balance preclude accurate assessment of potential changes or adverse impacts, at least until specific mining and reclamation plans/permit applications are evaluated in the future. PED Comments at 301 (response to comments of Sierra Club Legal Defense Fund). I therefore find, as described below, that petitioners' contentions that surface coal mining operations would adversely affect the hydrologic balance are not supported by the record.

1. Destruction of Aquifers and Associated Springs

The Department's studies indicate that proposed mining operations will not destroy all local aquifers as claimed by petitioners. Only parts of one localized aquifer -- the aquifer in the Dakota sanc stone coal-bearing formation -- would be destroyed by mining. PED I: 14. Other local aquifers that supply springs in the petition area w: not be affected because a 650-700 foot shale barrier separates the ac fers from the coal-bearing material that will be mined. PED III-14. This separation is graphically displayed in Figure IIA-2 at PED II-2:

Extensive information is available on springs in the area. PED III-13. Of the 44 springs in or near proposed mining areas that are shown in existing reports and on existing maps, 20 springs in or nea the Dakota formation would be destroyed or significantly affected, while 24 springs are not likely to be affected. PED III-13. The lc

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of water for the 20 affected springs is estimated to be 132 acre-feet per year. Ibid. Distribution of replacement water from the affected springs will not be difficult, and there will be sufficient time before loss occurs to conduct necessary studies and provide for water replacement. Ibid. In addition, UII has committed to develop alternative surface water sources as necessary to replace spring waters lost during mining operations. PED Comments at 411-412. Finally, the yields of the unaffected springs are appreciably greater than the yields of the affected springs. The estimated annual yield of the 24 unaffected springs is 550 acre-feet, as opposed to 132 acre-feet for the 20 affected springs. PED III-13 to III-14.

Underground mining in the petition area could cause local water-level declines, changes in direction of water flow, increased discha to lower beds and diversion of surface runoff into the ground. PED I 15. The amount of diversion would not exceed average annual runoff 20 to 25 acre-feet per square mile, but probably would range from ze to one-fourth of the annual runoff. PED III-15. Moreover, runoff s diverted would not be lost, but would be stored and eventually discharged, probably elsewhere in the same drainage area. PED III-15.

The water needs of an increased population created by mining in the petition area are estimated at 700 acre-feet per year and are probably the only long-term unavoidable impact on water supplies (assuming a long-term increase in population). PED III-15. UII assert that consumptive use of water by humans should be considered "a long term beneficial and best use" of the resource. PED Comments at 412. Water supplies for increased population would have to be developed

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or diverted from present uses. Ibid. The deep ground-water source of the Navajo sandstone aquifer has not been developed or appropriated for use by the State of Utah. PED II-8. The effects on the Navajo san stone aquifer discussed below would be increased proportionately if an additional 700 acre-feet per year were pumped from it. PED III-15.

I find that the record does not support petitioners' allegations that mining in the petition area would destroy all local aquifers and associated springs.

2. Alluvial Valley Floors.

The Department sponsored a study which identified alluvial valley floors that may underlie agricultural portions of the petition area. This 1980 study by Jack C. Schmidt, Earth Resources Consulting, update a 1977 study that found no alluvial valley floors in the Alton coal lease area. PED Comments at 133-134 (comments of Environmental Defens Fund) and 32 (Comments of UII). The location of possible alluvial valley floors is depicted in Figure IIB4-1 at PED II-8a. No commenter (including the petitioners and intervenors) has been able to determin whether the "essential hydrologic functions" of alluvial valley floors, as defined at 30 CFR 701.5, in the petition area will be damaged. The Surface Mining Act and applicable regulations require, however, that any future mining in these areas must be conducted so as to preserve or reestablish the essential hydrologic functions of identified alluvial valley floors. Sections 510(b)(5) and 515(b)(10); 30 CFR 785.19 and 822. A final determination on this issue will thus be made in reviewing specific mining and reclamation plans/permit applic tions in the future. I find that sufficient evidence is not availabl

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upon which to determine whether mining in the petition area will damage the essential hydrologic functions of alluvial valley floors.

3. Erosion and Effects on Streams Channels.

The record does demonstrate that surface coal mining operations in the petition area will cause increased erosion and surface runoff. This short-term impact would result from the removal of vegetation, topsoil and overburden handling and road construction associated with mining. PED III-15 and III-16. Reclamation activities such as regrading have similar effects. In particular, the longer post mining slopes resulting from regrading steep slope areas and the decreased infiltration on reclaimed lands may cause an increase in erosion. PED III-16. In turn, increased sediment in streams may change the sediment-carrying characteristics and locations of receiving streams. Ibid.

The presence of significant amounts of gravel in the stream beds of all major streams crossing strippable lands in the petition area and applicable regulations (concerning post mining topography, stabilization of gullies and rills created by erosion and general hydrologic balance) would limit long term effects on stream channels. Ibid.; 30 CFR 816.41-.57 and .100-.106; PED Comments at 24 (comments of BLM Cedar City, Utah, District Office) and 299 (comments of Sierra Club Legal Defense Fund). Furthermore, the record contains strong evidence that revegetation of mined areas will be successful. See findings on soils and revegetation above. Accordingly, any short term erosion and sediment effects will decrease and productivity of soils will increase as slopes become stabilized and vegetation reestablishe

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I therefore conclude that surface coal mining operations in the petition area will not cause long term adverse erosion and sediment effects, and that the short term impacts of mining will not inhibit reclamation of mined areas.

4. The Navajo Sandstone Aquifer.

The relationship between the coal within the petition area and the proposed Allen-Warner Valley Energy System is described in the Bureau of Land Management's environmental impact statement on that system. Allen-Warner Valley Energy System Final Environmental Impact Statement (AWV EIS), Volume 1, Chapter 2. Briefly, under the AWV proposal, coal within the Alton leasehold would be crushed, cleaned and combined with water at a preparation plant to form a coal slurry. AW EIS, Volume 1, p. 2-5. The coal slurry would be pumped from the prepa ation plant in two separate steel 12-inch diameter pipelines to two power plants. Water needed for the preparation plant and coal slurry pipelines would be supplied from deep wells drilled in the Navajo san stone aquifer. Ibid.

The State of Utah (PED Comments at 56 and 72), El Paso Coal Company (PED Comments at 107) and UII (PED Comments at 435-436) have steadfastly maintained that the question of pumping water from the Navajo sandstone aquifer for the slurry pipelines is not a proper iss in this designation proceeding, but is an issue solely within the jur isdiction of the State of Utah. In contrast, petitioners have maintained that the slurry system and its potential effects on the Navajo sandstone aquifer must be considered in the context of whether reclam ation is technologically and economically feasible (PED Comment at

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113-114 (comments of Environmental Defense Fund)) and that pumping i within the Surface Mining Act's definition of "surface coal mining o ations" (PED Comments at 321 (comments of Sierra Club and Friends of the Earth)).

The Department, through the Assistant Secretary for Energy and Minerals, has acknowledged during public hearings that the issue of water rights is within the exclusive domain of the State of Utah and not within the Secretary of the Interior's authority (9/29-30/80 Tr. p. 472-473); see also PED Comments at 663 (response to testimony of John Ferrell). The Department's specific responsibility, if any, to consider the impacts of the proposed coal slurry pipeline on wate quality and quantity (see Section 515(b)(15) of the Surface Mining Act) can only be determined once a specific mining and reclamation plan/permit application is filed.

Petitioners' claims concerning the Navajo sandstone aquifer we analyzed by the Department because petitioners alleged that pumping from the aquifer would adversely affect users who depend on it for water supplies. 9/29-30/80 Tr. p. 473. The PED analysis of this i indicates that pumping water from the Navajo sandstone aquifer for years may adversely affect the quantity of water in springs and wel the petition area. PED III-19. These effects may extend well beyo life of the mine because the petition area's ground water system ha slow response time. Ibid; PED Comments at 35 (comments of National Park Service, Rocky Mountain Regional Office).

As noted in both the PED (III-20) and the AWV EIS (4-3), there conflicting information on the characteristics and recharge capabil

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of the Navajo sandstone aquifer. As a result, accurate predictions of timing and location of impacts on water quantity could not be made. Se also, PED Comments at 24-25 (comments of BLM, Cedar City, Utah, Distric Office), 123-128 (comments of Environmental Defense Fund) and 293-295 and 297 (comments of Sierra Club Legal Defense Fund)). The Utility Commission of the City of St. George, Utah, reported that it has pumped millions of gallons of water from wells drilled in the Navajo formation with no effect on springs in the area either upstream or dow stream. PED Comments at 85. Other commenters noted that substantial quantities of water have been pumped from the Navajo sandstone aquifer for many years (PED Comments at 106 (comments of Bingham Engineering)) and that public demand could never exceed the available water in the aquifer (PED Comments at 413 (comments of UII)). Pumping tests and other studies now being performed by UII should provide additional information on pumping effects that can be analyzed in the context of a specific mining and reclamation plan/permit application for the Alton leasehold. PED III-20; PED Comments at 35 (comments of National Park Service, Rocky Mountain Regional Office), 295 (comments of Sierra Club Legal Defense Club) and 436 (comments of UII).

Finally, insufficient data exist to evaluate fully whether loss of good quality water available for public and irrigation use and degradation of aquifer quality by leakage from adjacent areas containing water of poor quality would affect water quality. PED III-19. I therefore conclude that present data are inadequate to determine whether pumping from the Navajo sandstone aquifer would adversely affect present users of the aquifer.

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In summary, I find that the record does not support petitioners' allegations that surface coal mining operations would significantly damage the hydrologic balance of the petition and surrounding areas by destroying aquifers and associated springs, by damaging the essential hydrologic functions of alluvial valley floors, by increasing erosion and sedimentation, and by reducing discharge from the Navajo sandston aquifer.

C. Renewable Resource Lands.

Petitioners claimed that I should exercise my discretion to desi nate the petition area unsuitable for surface coal mining operations because proposed mining operations would adversely affect renewable r source lands and result in substantial loss or reduction of long-rang productivity of water supply or of food or fiber products. Pet. ¶¶ 31-34. "Renewable resource lands" are defined to include "aquifers and areas for the recharge of aquifers and other underground waters, areas for agricultural or silvacultural production of food and fiber and grazing lands." Section 522(a)(3)(C); 30 CFR 701.5 and 762.11 (b)(3).

Petitioners' allegations concerning this designation criterion are closely related to the effects of mining on revegetation and hyd logic balance discussed above. Impacts cited by petitioners include destruction of aquifers and aquifer recharge capacity, accelerated erosion and sedimentation, and withdrawal of water from the Navajo sandstone aquifer. Pet. ¶¶12-15. Based on my prior statements and findings concerning revegetation and hydrologic balance, I decline to designate any of the petition area as unsuitable for mining on

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the basis of the renewable resource criterion.

D. Alternative Energy Sources.

Finally, petitioners alleged that "the planned AWV System (including the proposed Alton Coal Mine in the affected area) is not necessary to meet electrical energy needs." Pet. ¶36. They drew the conclusion that damage to important resources within the petition area can be avoided by developing other environmentally preferable and economically superior alternative energy sources, such as solar, conservation, cogeneration, geothermal, wind and hydropower. Pet. ¶¶35 and 36. Several commenters disagreed with petitioners' conclusions tha alternative energy sources are preferable or stated that any considera tion of such alternatives is more appropriate in the context of the De partment's forthcoming decision on the Allen-Warner Valley System. PEI Comments at 56 (comments of the State of Utah), 611 (testimony of Rob Houston), 640 (testimony of Jeannine Holt) and 682 (comments of M. Douglas Ahlstrom).

The issue of alternative energy sources has been evaluated in th PED, as provided by Section 522(d) of the Surface Mining Act and 30 C 769.17(e). This issue was also appropriate for consideration in compliance with the National Environmental Policy Act. 40 CFR 1502.14. Several specific alternatives to the Allen-Warner Valley System have been analyzed in detail in BLM's Environmental Impact Statement on that system. AWV EIS, Volume 1, Chapters 2 and 4.

I have concluded, however, that possible alternative energy sources do not constitute a basis for designating lands unsuitable for mining under Section 522(a) of the Surface Mining Act. Accord-

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ingly, I have deferred consideration of those alternatives to my consideration of the rights-of-way for the Allen-Warner System.

VI. FUTURE FEDERAL ACTION.

Under the terms of my decision dated December 16, 1980, as explained in the above Statement of Reasons, I have designated certain F eral lands unsuitable for surface coal mining operations in order to p vent significant damage to Bryce Canyon National Park. I have decline to designate other areas of Federal lands unsuitable for mining. None theless, it is likely that a variety of future Federal actions may be quested either in undesignated areas or for underground mining in the designated areas. In the future, specific proposals may be received b Federal agencies, such as right-of-way or mineral lease applications o mining claim plan of operations to the Bureau of Land Management, oil and gas drilling permit applications to the U.S. Geological Survey or mine plan/permit applications to the Office of Surface Mining. Whe ever bureaus of the Department receive such applications or requests, they are directed by paragraphs 6 and 7 of my decision to take all nec essary actions to implement this decision, including referral to the National Park Service of applications and requests that may affect Bryce Canyon National Park or the values for which it was established, and to take these factors into account in deciding whether to allow such activities on non-designated Federal lands near the park or underground mining in the designated area.

As set forth in the proclamation establishing Bryce Canyon National Park (Presidential Proclamation No. 1665, 43 Stat. 1914 (June 8, 1923)), the park's significant values are "unusual scenic

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beauty, scientific interest and importance." This proclamation is reinforced by the mandates of the Act of August 25, 1916 creating the National Park Service (National Park Service Organic Act), as amended, 16 U.S.C. §§ 1,2,3 and 4, to preserve the "scenery and the natural and historic objects and the wildlife therein" and to "leave them unimpaired for the enjoyment of future generations," and the directive of 16 U.S.C. § 1a-1 to protect, manage and administer the park in light of the "high public value and integrity of the National Park System" and in conformity with the values and purposes for which the park was established. In order to fulfill these responsibilities the Department bureaus that review future potential actions on Federal lands must ensure that such activities will not cause significant adverse impacts on Bryce Canyon National Park and that the values for which the park was established will be protected.

On the other hand, exploration for coal and other minerals may be conducted on Federal lands within the designated area and throughout the Alton and Henderson coal fields, so long as the requirements of applicable mining and minerals laws are satisfied. Those laws include Section 522(a)(1) of the Surface Mining Act (30 U.S.C. § 1272(a)(1)), Sections 2(b),8A, 9 and 23 of the Mineral Leasing Act (30 U.S.C. §§ 201(b), 208-1, 211 and 261), Sections 302(b) and 504(f) of the Federal Land Policy and Management Act (43 U.S.C. § 1732(b) and 1764(f)), and Sections 2 and 9 of the Mining in the Parks Act (16 U.S.C. §§ 1902 and 1908). The procedural and substantive requirements for such exploration include the Department's regulations at 30 CFR Part 744 and 43 CFR 3410 and 3416.6

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(coal exploration), as well as 36 CFR Part 9 (mining in the parks) and 43 CFR Parts 3045, 3802 and 3809 (other mineral exploration).

On undesignated areas of the Alton and Henderson coal fields wher Federal coal has already been leased, the lessees must file with OSM specific mining plans/permit applications in order to obtain permissic to conduct surface coal mining. Within the designated area, lessees r apply to conduct underground mining so long as that mining will not p: duce surface impacts that are visible from Bryce Canyon National Park except in T. 36S, R. 2W, of the Salt Lake Meridian, where visible surface impacts from underground mining may be permitted. See paragraph: 1 and 5 of my decision. In order to obtain approval to conduct minin the lessees must comply with the Department's regulations governing mining on Federal lands (30 CFR Subchapter D), as well as any applicable regulatory requirements of the State of Utah.

If Utah obtains my approval to assume exclusive jurisdiction over the regulation of surface coal mining and reclamation operations under Section 503 of the Surface Mining Act, it will then be eligible to enter into a cooperative agreement with the Department to regulate mining on Federal lands within Utah. Upon signing such an agreement, Utah would be primarily responsible for implementing and enforcing th permanent regulatory requirements of the Surface Mining Act for coal mining on Federal lands. The Department will still retain authority to approve mining plans, designate lands unsuitable for mining and regulate other activities on Federal lands, as provided in Sections 503(a)(5) and 523(c) of the Surface Mining Act.

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Once a mining plan/permit application for the Alton or Henderson coal field is received, it will then be reviewed by the Department and the State of Utah according to applicable State and/or Federal regulations. Upon receipt of an application, public notice will be issued and public hearings conducted pursuant to Section 513 of the Surface Mining Act. Federal, State or local governmental agencies will have an opportunity to file written objections to the application. 30 CFR 786.12.

At that time, the National Park Service and the Office of Surfa Mining will review the application to determine, as required by paragraph 5 of my decision, whether mining of these Federal leases would cause adverse impacts on the visual resources and noise levels in Bryce Canyon National Park. They may then recommend that special stipulations or conditions to mitigate such damage be included in the Department's decision on the mining plan/permit application, as provided in 30 CFR 741.18, 761.12 and 786.19.

As to any Federal lands within the designated area that are not ready subject to Federal lease, the Bureau of Land Management shall, under paragraph 7 of my decision, ensure that surface coal mining options are limited in accordance with Section 552(b) of the Surface Mining Act. Such limitations may include appropriate conditions on any leasing of the area for coal development or withdrawal of the land f leasing, as provided in 43 CFR 1601.6-6.

VII. LESSEE-INTERVENOR'S CLAIMS OF SUBSTANTIAL LEGAL AND FINANCIAL COMMITMENTS.

Section 522(a)(6) of the Surface Mining Act provides that an unsuitability designation shall not apply to lands "where substantia

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legal and financial commitments in [a surface coal mining] operation were in existence prior to January 4, 1977." 30 U.S.C. § 1272(a)(6). I understand that various companies holding leases in the petition area have intervened in this proceeding and have requested determinations by OSM, in accordance with 30 CFR Part 762. A preliminary decision by the Director of OSM on lessees' requests will be published subsequently in the Federal Register. Thereafter, all interested persons will be afforded an opportunity to comment on OSM's preliminary findings and to provide OSM with additional information concerning the requested exemptions. A final decision will then be issued by the Director of OSM, taking into account all such comments. Any appeal of that decision may be taken to the Department's Office of Hearings and Appeals, as provided in 43 CFR 4.1280-4.1286. I will therefore refrain from rendering any decision on those requests because I have delegated to the Board of Surface Mining Appeals the authority to make a final decision for the Department on such matters.

VIII. CONCLUSION.

The provisions of 30 CFR 769.18 will be followed in issuing this statement of reasons. Copies will be sent simultaneously by certified mail to the petitioners, the State of Utah, the intervenors and every other party to the petition proceeding. My decision of December 16, 1980, becomes final upon the date of signing this statement and any appeal from this decision must be filed within 60 days from this date in the United States District Court for Utah, as required by Section 526(a)(1) of the Surface Mining Act, 30 U.S.C. § 1276(a)(1).

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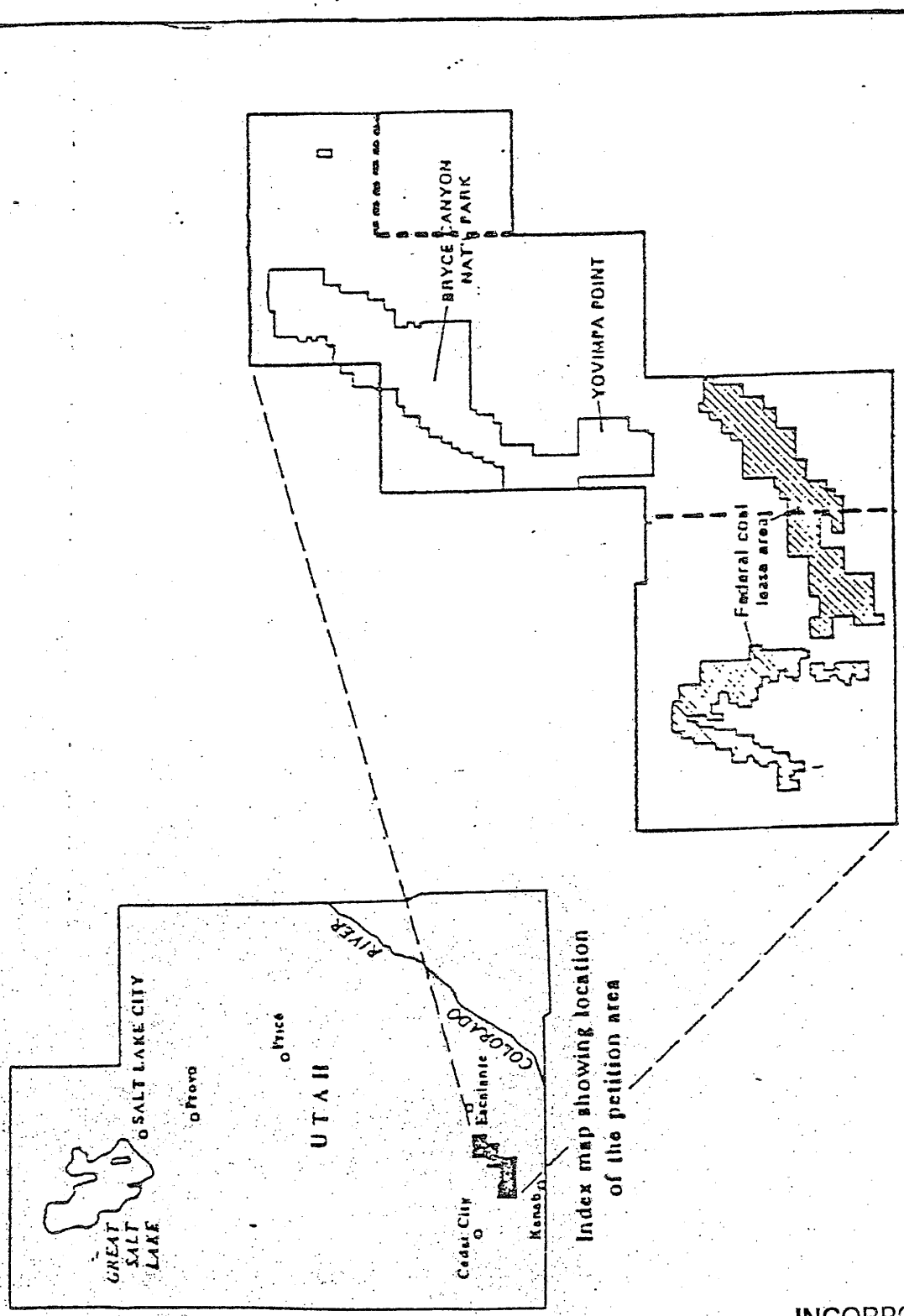
Appendix A



Index map showing location of the petition area

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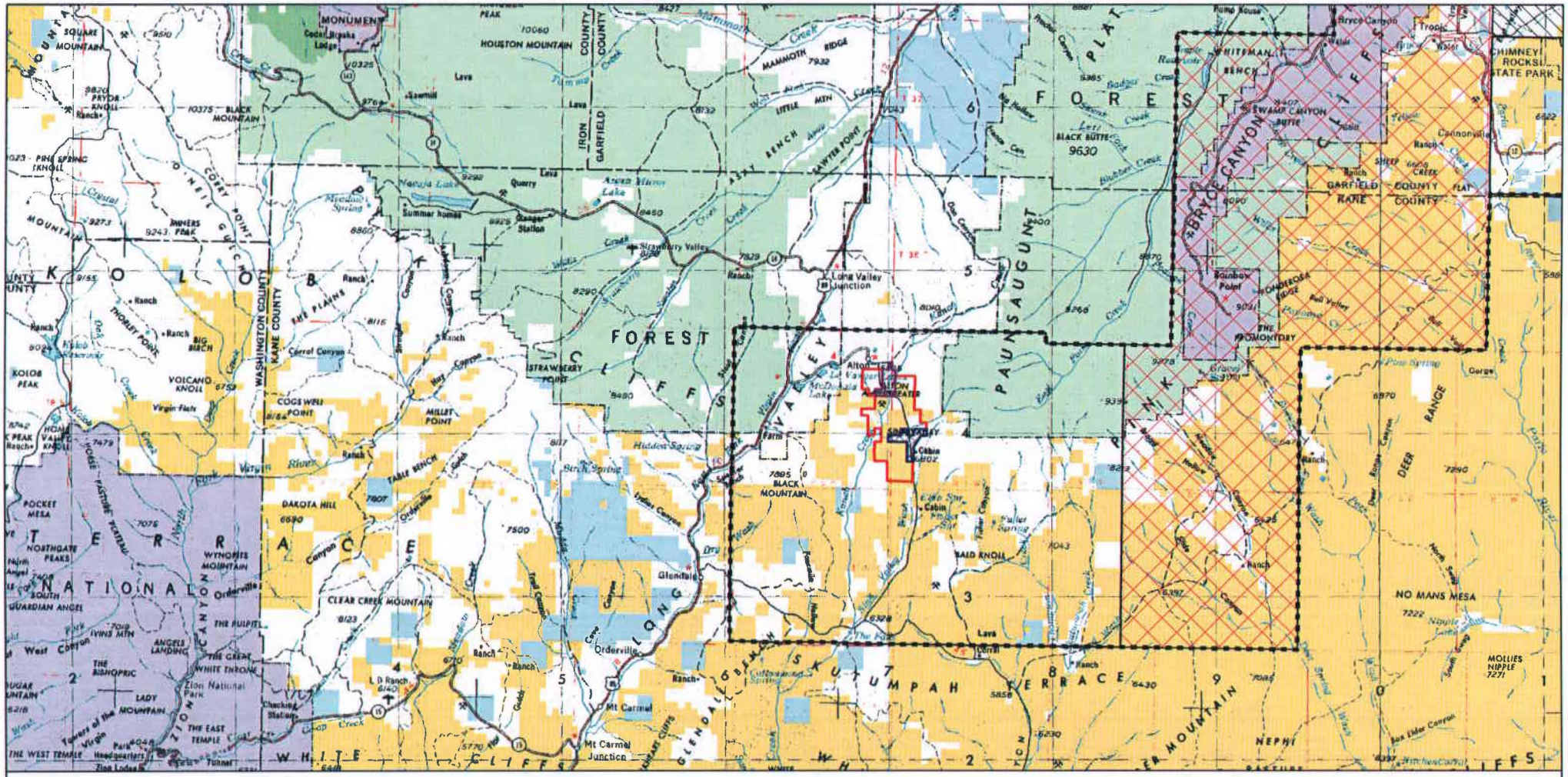

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ALTON MINE PETITION RULING -- Magnified area at right includes the 325,200-acre portion of southern Utah that was studied in the Alton mine petition. Secretary Andrus banned surface mining and surface effects of underground mining in the area nearest to Bryce Canyon National Park. The box area at upper right, cut off by dotted lines, and the portion of the Federal coal lease area at lower left west of the vertical dotted line, would be open to mining under the decision. Shaded area is the Alton coal field. About 10 percent of the mineable coal would be excluded from surface mining by the decision. -- Interior Dept. Map

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APPENDIX 1-4

Certificate of Liability Insurance

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ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 10/10/2008

PRODUCER (435) 637-7803 FAX: (435) 637-7811
James Banasky Insurance Inc.
6 West Main Street
Box 728
Price UT 84501

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.

INSURERS AFFORDING COVERAGE	NAIC #
INSURER A: Sobieski & Bradley Inc	
INSURER B:	
INSURER C:	
INSURER D:	
INSURER E:	

INSURED
Alton Coal Development, LLC
PO Box 1230
Huntington UT 84528

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.

INSR LTR	ADD'L INSRD	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	3586-33-72 DAL	5/19/2008	5/19/2009	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A		AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS HIRED AUTOS NON-OWNED AUTOS	(08) 7354-18-34	5/19/2008	5/19/2009	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
		GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT OTHER THAN AUTO ONLY: EA ACC AGG	$ $ $
		EXCESS/UMBRELLA LIABILITY OCCUR CLAIMS MADE DEDUCTIBLE RETENTION $				EACH OCCURRENCE AGGREGATE	$ $ $ $ $
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				WC STATUTORY LIMITS OTHER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ $ $
		OTHER					

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

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CERTIFICATE HOLDER

Utah Division of Oil, Gas and Mining
1594 W North Temple #1210
Salt Lake City, UT 84116

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 10 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

© ACORD CORPORATION 1988

APPENDIX 1-5

Proof of Publication

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Div. of Oil, Gas & Mining

Affidavit of Publication

STATE OF UTAH)
(SS.
COUNTY OF KANE)

COPY OF NOTICE

I, Dennis A. Brunner, being duly sworn, depose and say that I am General Manager of the SOUTHERN UTAH NEWS, a weekly newspaper of general circulation for Kane County, Utah and Coconino County, Arizona, and published every Wednesday at Kanab, Utah, and the notice attached hereto,

was published in said newspaper for: **FOUR**

consecutive weeks, the first publication on: **3/26/08**

and the last on: **4/16/08**

that said notice was published in the regular and entire issue of every number of the paper during the period and times of publication, and that the same was published in the newspaper proper and not in a supplement.

Dennis Brunner

Subscribed and sworn to before me April 30, 2008

Shannon Allen, Notary Public

Residing in Kanab, Utah.

My commission expires: 5-24-08

SHANNON ALLEN
NOTARY PUBLIC • STATE of UTAH
98 WEST CENTER
KANAB, UTAH 84741
COMM. EXPIRES 5-24-2008

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Div. of Oil, Gas & Mining

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Div. of Oil, Gas & Mining

Legal Notice
Public Notice for Permit Application

Notice is hereby given that Alton Coal Development, LLC is applying for a permit to conduct mining operations at the Coal Hollow Mine in Kane County, South Central Utah. The business address for Alton Coal Development is:
Alton Coal Development, LLC
463 North 100 West, Suite 1
Cedar City, UT 84720
Alton Coal Development has filed with the Utah Division of Oil, Gas & Mining a Mining and Reclamation Plan (MRP) application number C/025/0005. This Application has been filed for the Coal Hollow Mine, a surface coal mining operation. The Coal Hollow Mine is located approximately 35 miles north of Kanab, Utah (the Kane County seat) and approximately 4 miles south of the town of Alton, Utah.

Project Area Legal Description
All certain real property situated in Township 39 South, Range 5 West, SLB&M, Kane County, Utah, more particularly described as follows:

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M Section 30: All of Section Lot #1 (NW1/4 NW 1/4); NE1/4 NW1/4; N1/2 NE1/4;
ALSO: BEGINNING 3.50 chains West of the East Quarter corner of Said Section 30, and running South 34° 34' West 22.64 chains to the 1/16 section line; thence West 2.64 chains to the Southwest corner of NE1/4 SE1/4 of Said Section 30; thence North 40.00 chains; thence East 20.00 chains; thence South 14.69 chains; thence southwesterly to the point of beginning...containing 217.64 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M Section 30: BEGINNING at a point 5.31 chains North of the E1/4 corner of Said Section 30, and running thence South 45.31 chains; thence West 20.00 chains; thence North 20.00 chains; thence East 2.64 chains; thence North 34° 34' East 22.64 chains to the 1/16 section line; thence North 33° 22' East to the point of beginning...containing 61.96 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M Section 29: BEGINNING at the Northwest corner of Said Section 29, and running thence South 34.69 chains; thence North 33°22' East 35.50 chains; thence North 40° West 0.58 chains; thence North 37°30' East 12.30 chains; thence West 22.23 chains to the point of beginning...containing 36.04 acres, more or less.

DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M Section 19: SW1/4SE1/4, E1/2SE1/4, SE1/4NE1/4...containing 160.0 acres, more or less

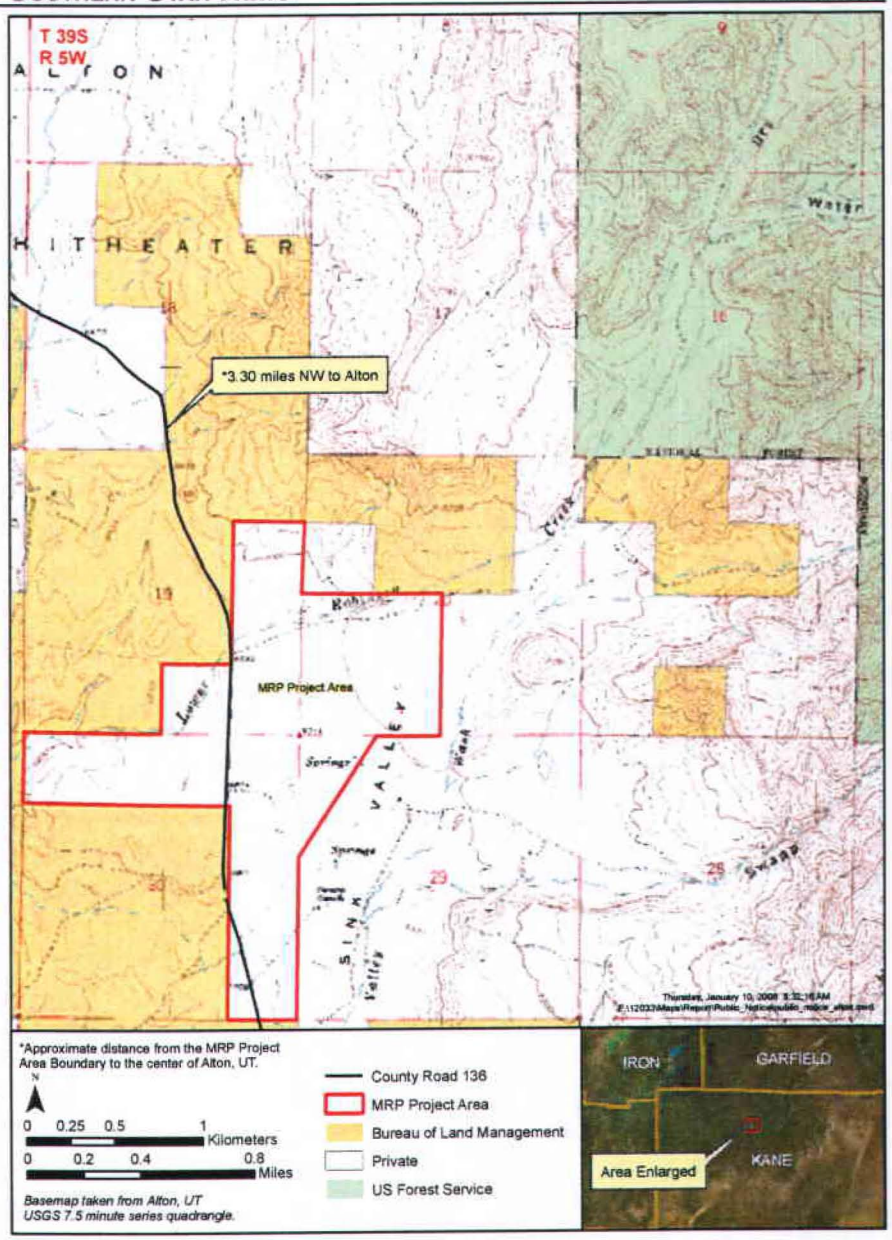
DESCRIPTION: TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M Section 20: SW1/4...containing 160.0 acres, more or less County Road 136 currently intersects the Coal Hollow Mine Project Area. Approximately two miles of this road will be temporarily relocated to allow for mining operations. This relocated section begins approximately three miles south of the Town of Alton and will reconnect with the original road approximately five miles south of the Town. This relocation will occur in year one of mining operations and is expected to be reestablished to the approximate original location in a time frame ranging from year four to year five of the mining operation.
The permit application area is located on the Alton, Utah, U.S. Geological Survey 7.5 minute quadrangle map. The application was filed and this notice is prepared and published to comply with the Surface Mining Control and Reclamation Act of 1977 and State and Federal regulations promulgated pursuant to said act.
A copy of Alton Coal Development's permit application will be filed for public inspection at:
Kane County Recorder Office
76 North Main
Kanab, Utah 84741; and

The State of Utah
Department of Natural Resources
Division of Oil, Gas & Mining
1549 West Temple, Suite 1210
Salt Lake City, Utah 84116

Written comments, objections or requests for informal conferences on the application may be submitted to the Division of Oil, Gas and Mining at the following mailing address:
Department of Natural Resources
Division of Oil, Gas & Mining
P.O. Box 145801
Salt Lake City, UT 84114-5801

See map on right

Published in the *Southern Utah News* on March 26, April 2, 9 & 16, 2008. Written comments or objections must be submitted within 30 days following the final publication of this advertisement.



PUBLIC NOTICE

Petition for annexation have been filed in the office of the Kanab City Recorder for the purpose of requesting annexation of parcels of land belonging to WSC Partners LLC located at approximately NW ¼ & SN1/4 of Section 4, T44S, R6 W S.L. B. M., more specifically described as follows:
BEGINNING AT THE WEST QUARTER CORNER OF SECTION 4, TOWNSHIP 44 SOUTH, RANGE 6 WEST, OF THE SALT LAKE BASE AND MERIDIAN; THENCE N00°32'54"E, ALONG THE SECTION LINE AND ALONG THE EAST LINE OF THE KANAB CREEK RANCHOS SUBDIVISION, (UNITS 4,6, AND 7) 1,316.97 FEET TO THE 1/16TH CORNER; THENCE N89°53'23"E, ALONG THE 1/16TH LINE, 930.31 FEET; THENCE DEPARTING SAID LINE AND RUNNING S00°32'54"W, 404.25 FEET; THENCE S89°27'06"E, 122.50 FEET; THENCE S01°30'00"W, 574.10 FEET TO THE NORTH LINE OF THE RONALD R. SMITH PROPERTY; THENCE S89°52'02"W, ALONG SAID LINE, 294.98 FEET; THENCE S00°07'58"E, 75.21 FEET; THENCE S89°52'02"W, 33.67 FEET; THENCE S00°07'58"E, 261.75 FEET TO A POINT LOCATED ON THE EAST-WEST CENTER SECTION LINE; THENCE S89°52'02"W, ALONG SAID LINE, 65.33 FEET TO THE 1/16TH CORNER; THENCE S00°30'46"W, ALONG THE 1/16TH LINE 268.03 FEET; THENCE DEPARTING SAID LINE AND RUNNING N89°59'57"W, 32.67 FEET; THENCE S00°30'46"W, 1,045.24 FEET TO A POINT LOCATED ON THE 1/16TH LINE; THENCE N89°59'34"W, ALONG THE 1/16TH LINE, 620.98 FEET TO THE 1/16TH CORNER; THENCE N00°31'40"E, ALONG THE SECTION LINE, 1,311.68 FEET TO THE POINT OF BEGINNING. CONTAINING 46.98 ACRES.

Notice of the certification was received by the Kanab City Council on December 10, 2007. The complete annexation petition is available for inspection and copying at the office of the Kanab City Recorder, located at 76 North Main Street, Kanab, Utah.

Kanab City may grant the petition and annex the area described in the petition unless a written protest to the annexation is filed with the Kane County Boundary Commission located at 76 North Main, Kanab, Utah 84741, and a copy of the protest delivered to the Kanab City Recorder by 11:00 a.m. on April 14, 2008. A protest of the annexation petition may be filed by the Legislative body or governing board of an affected entity.

If no protest is filed during the protest period, Kanab City will hold a public hearing to consider the annexation request. Kanab City Planning Commission will hear the request on April 15, 2008 beginning at 7:00 p.m. and the Public Hearing before the Kanab City Council will be held on April 22, 2008 beginning at 7:00 p.m. Hearings will be held in the Kane County Court House located at 76 North Main, Kanab, Utah 84741.

Keith McAllister
Kanab City Recorder

Published in the *Southern Utah News* on March 26, April 2 and 9, 2008.

See LEGALS, Page 19

APPENDIX 1-6

A notarized statement attesting to the accuracy

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Div. of Oil, Gas & Mining

VERIFICATION STATEMENT

STATE OF UTAH)
:ss
COUNTY OF IRON)

I, Chris R. McCourt, herby certify that I am the manager for the applicant, Alton Coal Development, L.L.C., and that the information contained in this application for the Coal Hollow Mining and Reclamation Plan is true and correct to the best of my knowledge and belief, in all respects, with the laws of Utah, specifically in reference to the applicant's commitments, undertaking and obligations herein.

Signed: Chris R. McCourt
Position: Manager

SUBSCRIBED and SWORN TO by CHRIS R. MCCOURT, the Manager of Alton Coal Development, L.L.C., before me this 22 day of January, 2008.

Notary Public: Catherine Stucki

My Commission Expires: 5/26/10

NOTARY PUBLIC
CATHERINE STUCKI
7181 S. CAMPUS VIEW DR
WEST JORDAN, UTAH 84084
COMMISSION EXPIRES
MAY 26, 2010
STATE OF UTAH

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APPENDIX 1-7

County Road 136 (K3900) Approvals and Agreements

Alton Coal Development, LLC and Kane County Agreement
(Kane County Road 136 (K3900) Closure, Relocation and Replacement)

And

Grant of Easement and Assignment Agreement for County Road 136
(Easement for Reestablishment of County Road 136 on C. Burton Pugh Property in the postmining, modified alignment)

And

Kanab Field Office, Bureau of Land Management
County Road 136 Relocation – Environmental Assessment and Finding of No Significant Impact

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Resolution 2008-33
Temporary Road Closure
Alton Coal

AGREEMENT

AN AGREEMENT TO TEMPORARILY CLOSE, RELOCATE AND REPLACE KANE COUNTY ROAD NUMBER K3900, KNOWN AS THE SINK VALLEY ROAD

THIS AGREEMENT ("Agreement") is made and entered into this 24th day of 2008, by and between Kane County, a body corporate and politic, having an address of 76 North Main Street, Kanab, Utah 84741 ("County"), and Alton Coal Development, LLC ("Alton Coal"), having an address of 463 North 100 West, Suite 1, Cedar City, Utah 84720.

RECITALS

WHEREAS, Alton Coal has applied with the Utah Division of Oil, Gas & Mining ("Division") for a permit to conduct coal mining operations at the Coal Hollow Mine under application number C/025/0005. The Mine will be developed on private lands located in Kane County, Utah, approximately 4 miles south of the Town of Alton within Sections 20, 29 and 30, Township 39 South, Range 5 West, SLB&M ("Mine Permit Area"); and

WHEREAS, a portion of Kane County Road K3900 ("Kane County Road K3900"), is located within the Mine Permit Area; and

WHEREAS, Kane County Road K3900 is a Class B multiple use public road and is part of the highway and road system within the sole jurisdiction, maintenance and control of Kane County pursuant to Utah Code Ann. § 72-3-103(4); and

WHEREAS, for the public health, safety and welfare, a portion of Kane County Road K3900 will be relocated outside the boundaries of the Mine Permit Area during the period of

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mining activities within the Mine Permit Area ("Relocated Section") and then restored to its original location; and

WHEREAS, the two mile section of County Road K3900 located within the Mine Permit boundaries will be subject to long-term closure during mining activities; and

WHEREAS, the Relocated Section of Kane County Road K3900 will be located on public lands administered by the federal Bureau of Land Management ("BLM"). Alton Coal has applied for a right of way for the Relocated Section ("ROW") under Title V, Federal Land Policy and Management Act ("FLPMA") and intends to assign the BLM ROW so acquired to Kane County. A true and correct copy of this application is attached hereto as Exhibit 1; and

WHEREAS, the Relocated Section begins approximately three (3) miles south of the Town of Alton and will reconnect with the existing public road approximately five (5) miles south of the Town of Alton. *See* Plan of Development attached to BLM Application, Exhibit 1; and

WHEREAS, on June 16, 2008, the Division held a public hearing in Alton, Utah, on the relocation of Kane County Road K3900 pursuant to Utah Administrative Code R645-103-234 and will issue findings on this matter; and

WHEREAS, this Agreement confirms the responsibilities of Kane County and Alton Coal with respect to the temporary closure, rerouting and replacement of Kane County Road 3900; and

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WHEREAS, this Agreement further confirms that both the two-mile segment of Kane County Road K3900 within the Mine Permit Area, to be temporarily closed during mining and reopened albeit on a realigned right-of-way (ROW) thereafter and the Relocated Segment are Class B multiple-use "public roads" within the jurisdiction of Kane County and exempt from regulation under Mine Permit No. C/025/0005 consistent with criteria adopted by the Division's 1995 Public Road Policy, attached hereto as Exhibit 2.

AGREEMENT

NOW, THEREFORE, for and in consideration of the premises, the mutual covenants and agreements of the parties hereto, and the consideration in favor of the County described below, the parties hereto agree as follows:

I. PUBLIC ROAD CLASSIFICATION

Kane County Road K3900 is a Class B, multiple-use, public road and is part of the County and State highway and road system within the sole jurisdiction, maintenance and control of Kane County pursuant to Utah Code Ann. § 72-3-103(4).

II. CLOSURE OF PORTION OF KANE COUNTY ROAD K3900

A. Upon approval of Mine Permit C/025/0005, Kane County will follow the procedures for long-term closure of a public road pursuant to Utah law. Following these procedures, the two-mile segment of Kane County Road K3900 within the Mine Permit Area will be closed and the public road will be relocated to an alternate route along the Relocated Segment per the map attached as Exhibit 3.

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B. Kane County has determined that closure is authorized as follows:

1. Alton Coal has provided an alternate route via the Relocated Segment to be located within the BLM ROW. The Relocated Segment has been accepted by the Kane County Commissioners and the BLM ROW for the Relocated Segment will be assigned to Kane County; and

2. Kane County Commissioners will hold a hearing following public notice on the long-term closure;

and

3. Kane County intends to enact an ordinance authorizing the long-term closure.

III. PUBLIC LAND RIGHT OF WAY

A. Alton Coal has applied to the BLM for a right of way grant ("ROW Grant") across public land for the Relocated Segment. Alton Coal agrees to pay for all filing fees, costs of processing the ROW Grant (including expenses related to retaining a third party contractor to assist BLM with its environmental analysis of the application) and the first year rental payment.

B. Upon BLM's issuance of the ROW Grant, Alton Coal agrees to assign the ROW Grant for the Relocated Segment to Kane County. This assignment is for the purpose of securing Kane County's jurisdiction to the Relocated Segment of County Road K3900 and is not to avoid regulation. Pursuant to Utah Code Ann. § 72-5-103, the County has authority to acquire the BLM ROW pursuant to the terms of this Agreement.

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IV. RELOCATION AND REPLACEMENT OF KANE COUNTY ROAD 3900

A. Kane County has authority pursuant to Utah Code Ann. § 17-50-305 to acquire, construct and maintain Class B County roads. Kane County will be responsible to supervise the design of any improvements to the Relocated Segment of Kane County Road K3900 as set forth in the attached Plan of Development ("Phase I Improvements"). Alton Coal will pay all costs. Alton Coal will notify Kane County at the point in its mine development that relocation and replacement of Kane County Road K3900 may commence. Kane County will provide Alton Coal with thirty (30) days written notice prior to commencing road construction. The County will also be responsible to supervise the design for the reconstruction of the two-mile segment of the Kane County Road K3900 following the completion of mining activities ("Phase II Improvements"). Alton Coal will pay any and all costs associated with said construction. Kane County will develop a Scope of Work regarding these road improvements. The Scope of Work will be performed according to the plans and specifications as approved by Kane County's professional engineer. Alton Coal will pay for developing said Scope of Work and all costs associated thereto. Once the detailed engineering design for each phase is completed, the County will provide Alton Coal with the Scope of Work and a preliminary cost estimate for the Scope of Work for each phase of construction.

B. Alton Coal agrees to pay to the County prior to the commencement of each phase of the Scope of Work and for that phase only, along with any incidentals associated with this improvement project as set forth in the Scope of Work based on the preliminary cost estimate for that phase. Alton Coal's obligation for payment shall be subject to the following limitations:

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1. The County will provide Alton Coal with project cost estimates for the Scope of Work of each phase.

2. A written agreement approving the Scope of Work and cost estimate for each phase of development will be approved by both parties. Prior to commencement of work, Alton Coal shall provide the County with a written request to proceed.

3. Funds provided by Alton Coal in an amount equal to the estimated cost for a particular phase of development shall be held by the County in a third party escrow account. Interest earned in that account shall belong to Alton Coal. Upon receipt of said funds, the County will proceed with the Scope of Work.

4. Construction bids will be received by the County. An abstract of bids will be submitted to Alton Coal for approval. Alton Coal will approve the awarding of the bid. The escrow account balance will be adjusted to equal the amount of the bid, plus 5%. The County will award the contract and proceed with the Scope of Work.

5. The County will obtain Alton Coal's prior permission before issuing a change order that will cause the total expenditures with respect to the Scope of Work to exceed the amount originally approved by Alton Coal.

6. The County will provide Alton Coal with a copy of each of the Partial Pay Estimates as issued for any and all costs incurred in connection with performance of the Scope of Work.

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7. Alton Coal shall be provided with the opportunity to audit the records with respect to such Partial Pay Estimates and to audit the final close out of any construction contract relating to the Scope of Work.

V. MISCELLANEOUS PROVISIONS

A. All of the parties understand and agree that the Kane County Road K3900 is a Class B county road for which Kane County remains responsible, including but not limited to responsibility for road maintenance. Alton Coal will be responsible for incidental maintenance as requested by the County, including dust control by chemical treatment.

B. Alton Coal agrees to indemnify and hold Kane County and each of their commissioners, officers, offices, employees, agents, limited liability company members and affiliates ("Indemnities"), heirs, assigns or successors harmless of and from any liability, cost or expense, including defense costs, from any claim, demand or action which may be brought again Indemnities and which arises out of or alleges any negligence or responsibility on the part of Indemnities in the design or construction of the Kane County Road K3900 as well as any and all actions taken under this contract. This obligation to indemnify and hold harmless commences upon execution of this Agreement during performance of the Scope of Work for Phase I and Phase II Improvements and shall terminate upon the County's completion of the reconstruction and replacement of the Kane County Road K3900.

C. The County further agrees to continue maintenance of the Kane County Road K3900 past the north reroute diversion point to the Coal Hollow Mine permit boundary. This section consists of approximately 3,500 feet of gravel road between the north diversion point

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and the mine permit boundary, on federal land, which will continue to be under the sole jurisdiction of Kane County as a public road.

D. It is further agreed by Kane County and Alton Coal that Alton Coal's contributions do not convey jurisdiction, authority or responsibility to Alton Coal regarding the construction, maintenance or operation of Kane County Road K3900 beyond the terms of this Agreement. Said road will remain a Class B County network road under the sole authority of Kane County pursuant to Utah Code Ann. § 72-3-103(4).

This Agreement, together with its attached exhibits, constitutes the entire Agreement between the parties and supersedes and replaces any and all prior negotiations, representations, warranties, understandings or contracts between the parties. This Agreement cannot be changed except by written agreement of the parties.

Dated this 9th day of ~~November~~ December, 2008

Alton Coal Development, LLC

Subscribed and sworn to before me this 9 day of ~~November~~ December, 2008. christopher mccurr only

Notary Public

Dated this 24th day of November, 2008

Daniel Hulet, Commissioner

Dated this 24th day of November, 2008

Mark Habbeshaw, Commissioner

Dated this 24th day of November, 2008

Duke Cox, Commissioner

Attest to the signatures of three (3) Commissioners.

Kane County Clerk

TANISHA EVERETT
Notary Public
State of Utah
My Comm. Expires Aug 6, 2011
377 N Main Cedar City UT 84720-2639

SEAL COUNTY CLERK/AUDITOR BE JUST KANE COUNTY STATE OF UTAH

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EXHIBIT 1

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OCT 15 2009
Div. of Oil, Gas & Mining

886546

STANDARD FORM 299 (1/2006)
Prescribed by DOI/USDA/DOT
P.L. 96487 and Federal
Register Notice 5-22-95

APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

FORM APPROVED
OMB NO. 1004-0189
Expires: November 30, 2008

FOR AGENCY USE ONLY
Application Number
Date filed

NOTE: Before completing and filing the application, the applicant should completely review this package and schedule a preapplication meeting with representatives of the agency responsible for processing the application. Each agency may have specific and unique requirements to be met in preparing and processing the application. Many times, with the help of the agency representative, the application can be completed at the preapplication meeting.

1. Name and address of applicant *(include zip code)*

Alton Coal Development, LLC
463 N 100 W, Suite 1
Cedar City, UT 84720

2. Name, title, and address of authorized agent if different from Item 1 *(include zip code)*

3. TELEPHONE *(area code)*
Applicant **435-867-5331**
Authorized Agent

4. As applicant are you? *(check one)*
- a. ☐ Individual
- b. ☑ Corporation*
- c. ☐ Partnership/Association*
- d. ☐ State Government/State Agency
- e. ☐ Local Government
- f. ☐ Federal Agency

** If checked, complete supplemental page*

5. Specify what application is for: *(check one)*
- a. ☑ New authorization
- b. ☐ Renewing existing authorization No.
- c. ☐ Amend existing authorization No.
- d. ☐ Assign existing authorization No.
- e. ☐ Existing use for which no authorization has been received*
- f. ☐ Other*

**If checked provide details under Item 7*

6. If an individual, or partnership are you a citizen(s) of the United States? ☐ Yes ☐ No

7. Project description *[describe in detail)*: (a) Type of system or facility, *(e.g., canal, pipeline, road)*; (b) related structures and facilities; (c) physical specifications *(length, width, grading, etc.)*; (d) term of years needed; (e) time of year of use or operation; (f) Volume or amount of product to be transported; (g) duration and timing of construction; and (h) temporary work areas needed for construction *(Attach additional sheets, if additional space is needed.)*

(a) Relocation of County Road 136.
(b) No permanent structures or facilities are anticipated as part of the road relocation.
(c) 3.1 miles long, 24 foot gravel road in a 66 foot ROW, grading varies from 0.5% to 8%, clearing width varies from 30 ft to 100 ft, with cut/fill slope ratios of 2:1 and 3:1, respectively.
(d) Approximately 5-10 years.
(e) Depending on site and weather conditions and time of year once the ROW is issued, construction would take approximately 3-4 months.
(f) Approximately 9,000 cubic yards of gravel.
(g) Approximately 3-4 months.
(h) Approximately 2 acres would be needed for temporary use areas.

Please see the attached Plan of Development for further details.

8. Attach a map covering area and show location of project proposal

9. State or local government approval: ☐ Attached ☑ Applied for ☐ Not required

10. Nonreturnable application fee. ☑ Attached ☐ Not required

11. Does project cross international boundary or affect international waterways? ☐ Yes ☑ No *(If "yes," indicate on map)*

12. Give statement of your technical and financial capability to construct, operate, maintain, and terminate system for which authorization is being requested.

Alton Coal Development, LLC is privately owned company licensed to operate in the State of Utah. The company has successfully operated since 2004 without any defaults as to technical or financial capability to construct, operate, maintain and to terminate said rights-of-way.

(Continued on page 2)

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13a. Describe other reasonable alternative routes and modes considered.

Alton Coal considered additional routes and locations of the ROW. An Environmental Assessment will be prepared discussing the other routes that were considered.

b. Why were these alternatives not selected?

Other routes considered were eliminated for various constraints including, but not limited to, environmentally sensitive areas, cultural resources, public safety, and topography.

c. Give explanation as to why it is necessary to cross Federal Lands

The route proposed on federal land is a result of the various reviewed Alternatives, and the constraints identified during the route selection process. Crossing federal land is necessary to comply with state and federal coal permitting/mining regulations with respect to the proposed Coal Hollow mine (permit number C/025/005) currently in review at Utah Division of Oil, Gas and Mining.

14. List authorizations and pending applications filed for similar projects which may provide information to the authorizing agency. *(Specify number, date, code, or name)*

Alton Coal Development Lease By Application (UTU081895).

15. Provide statement of need for project, including the economic feasibility and items such as: (a) cost of proposal *(construction, operation, and maintenance);* (b) estimated cost of next best alternative; and (c) expected public benefits.

See attached Plan of Development.

16. Describe probable effects on the population in the area, including the social and economic aspects, and the rural lifestyles.

An Environmental Assessment will be prepared discussing the impacts of the project based on the BLM ID checklist.

17. Describe likely environmental effects that the proposed project will have on: (a) air quality; (b) visual impact; (c) surface and ground water quality and quantity; (d) the control or structural change on any stream or other body of water; (e) existing noise levels; and (f) the surface of the land, including vegetation, permafrost, soil, and soil stability.

An Environmental Assessment will be prepared discussing the impacts of the project based on the BLM ID checklist.

18. Describe the probable effects that the proposed project will have on (a) populations of fish, plantlife, wildlife, and marine life, including threatened and endangered species; and (b) marine mammals, including hunting, capturing, collecting, or killing these animals.

An Environmental Assessment will be prepared discussing the impacts of the project based on the BLM ID checklist.

19. State whether any hazardous material, as defined in this paragraph, will be used, produced, transported or stored on or within the right-of-way or any of the right-of-way facilities, or used in the construction, operation, maintenance or termination of the right-of-way or any of its facilities. "Hazardous material" means any substance, pollutant or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq., and its regulations. The definition of hazardous substances under CERCLA includes any "hazardous waste" as defined in the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, 42 U.S.C. 9601 et seq., and its regulations. The term hazardous materials also includes any nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance under CERCLA Section 101(14), 42 U.S.C. 9601(14), nor does the term include natural gas.

It is not anticipated that hazardous materials will be used, produced, transported, or stored within the ROW, or any of the ROW facilities.

20. Name all the Department(s)/Agency(ies) where this application is being filed.

Bureau of Land Management
Kanab Field Office
318 North 100 East
Kanab, UT 84741

I HEREBY CERTIFY, That I am of legal age and authorized to do business in the State and that I have personally examined the information contained in the application and believe that the information submitted is correct to the best of my knowledge.

Signature of Applicant	Date 4-24-08

Title 18, U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make 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.

(Continued on page 3)

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APPLICATION FOR TRANSPORTATION AND UTILITY SYSTEMS AND FACILITIES ON FEDERAL LANDS

GENERAL INFORMATION
ALASKA NATIONAL INTEREST LANDS

This application will be used when applying for a right-of-way, permit, license, lease, or certificate for the use of Federal lands which lie within conservation system units and National Recreation or Conservation Areas as defined in the Alaska National Interest Lands Conservation Act. Conservation system units include the National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Trails System, National Wilderness Preservation System, and National Forest Monuments.

Transportation and utility systems and facility uses for which the application may be used are:

1. Canals, ditches, flumes, laterals, pipes, pipelines, tunnels, and other systems for the transportation of water.
2. Pipelines and other systems for the transportation of liquids other than water, including oil, natural gas, synthetic liquid and gaseous fuels, and any refined product produced therefrom.
3. Pipelines, slurry and emulsion systems, and conveyor belts for transportation of solid materials.
4. Systems for the transmission and distribution of electric energy.
5. Systems for transmission or reception of radio, television, telephone, telegraph, and other electronic signals, and other means of communications.
6. Improved rights-of-way for snow machines, air cushion vehicles, and all-terrain vehicles.
7. Roads, highways, railroads, tunnels, tramways, airports, landing strips, docks, and other systems of general transportation.

This application must be filed simultaneously with each Federal department or agency requiring authorization to establish and operate your proposal.

In Alaska, the following agencies will help the applicant file an application and identify the other agencies the applicant should contact and possibly file with:

Department of Agriculture
Regional Forester, Forest Service (USFS)
Federal Office Building, P.O. Box 21628
Juneau, Alaska 99802-1628
Telephone: (907) 586-7847 *(or a local Forest Service Office)*

Department of the Interior
Bureau of Indian Affairs (BIA)
Juneau Area Office
9109 Mendenhall Mall Road, Suite 5, Federal Building Annex
Juneau, Alaska 99802
Telephone: (907) 586-7177

Bureau of Land Management (BLM)
222 West 7th Ave., Box 13
Anchorage, Alaska 99513-7599
Telephone: (907) 271-5477 *(or a local BLM Office)*

National Park Service (NPS)
Alaska Regional Office, 2525 Gambell St., Rm. 107
Anchorage, Alaska 99503-2892
Telephone: (907) 257-2585

U.S. Fish & Wildlife Service (FWS)
Office of the Regional Director
1011 East Tudor Road
Anchorage, Alaska 99503
Telephone: (907) 786-3440

Note-Filings with any Interior agency may be filed with any office noted above or with the: Office of the Secretary of the Interior, Regional Environmental Officer, Box 120, 1675 C Street, Anchorage, Alaska 99513.

Department of Transportation
Federal Aviation Administration
Alaska Region AAL-4, 222 West 7th Ave., Box 14
Anchorage, Alaska 99513-7587
Telephone: (907) 271-5285

NOTE - The Department of Transportation has established the above central filing point for agencies within that Department. Affected agencies are: Federal Aviation Administration (FAA), Coast Guard (USCG), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA).

OTHER THAN ALASKA NATIONAL INTEREST LANDS

Use of this form is not limited to National Interest Conservation Lands of Alaska.

Individual departments/agencies may authorize the use of this form by applicants for transportation and utility systems and facilities on other Federal lands outside those areas described above.

For proposals located outside of Alaska, applications will be filed at the local agency office or at a location specified by the responsible Federal agency.

SPECIFIC INSTRUCTIONS
(Items not listed are self-explanatory)

Item

7 Attach preliminary site and facility construction plans. The responsible agency will provide instructions whenever specific plans are required.

8 Generally, the map must show the section(s), township(s), and ranges within which the project is to be located. Show the proposed location of the project on the map as accurately as possible. Some agencies require detailed survey maps. The responsible agency will provide additional instructions.

9, 10, and 12 - The responsible agency will provide additional instructions.

13 Providing information on alternate routes and modes in as much detail as possible, discussing why certain routes or modes were rejected and why it is necessary to cross Federal lands will assist the agency(ies) in processing your application and reaching a final decision. Include only reasonable alternate routes and modes as related to current technology and economics.

14 The responsible agency will provide instructions.

15 Generally, a simple statement of the purpose of the proposal will be sufficient. However, major proposals located in critical or sensitive areas may require a full analysis with additional specific information. The responsible agency will provide additional instructions.

16 through 19 - Providing this information in as much detail as possible will assist the Federal agency(ies) in processing the application and reaching a decision. When completing these items, you should use a sound judgment in furnishing relevant information. For example, if the project is not near a stream or other body of water, do not address this subject. The responsible agency will provide additional instructions.

Application must be signed by the applicant or applicant's authorized representative.

If additional space is needed to complete any item, please put the information on a separate sheet of paper and identify it as "Continuation of Item".

(For supplemental, see page 4)

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SUPPLEMENTAL		
NOTE: The responsible agency(ies) will provide additional instructions	CHECK APPROPRIATE BLOCK	
I - PRIVATE CORPORATIONS	ATTACHED	FILED*
a. Articles of Incorporation	☐	☐
b. Corporation Bylaws	☐	☐
c. A certification from the State showing the corporation is in good standing and is entitled to operate within the State.	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. The name and address of each shareholder owning 3 percent or more of the shares, together with the number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote and the name and address of each affiliate of the entity together with, in the case of an affiliate controlled by the entity, the number of shares and the percentage of any class of voting stock of that affiliate owned, directly or indirectly, by that entity, and in the case of an affiliate which controls that entity, the number of shares and the percentage of any class of voting stock of that entity owned, directly or indirectly, by the affiliate.	☐	☐
f. If application is for an oil or gas pipeline, describe any related right-of-way or temporary use permit applications, and identify previous applications	☐	☐
g. If application is for an oil and gas pipeline, identify all Federal lands by agency impacted by proposal.	☐	☐
II - PUBLIC CORPORATIONS		
a. Copy of law forming corporation	☐	☐
b. Proof of organization	☐	☐
c. Copy of Bylaws	☐	☐
d. Copy of resolution authorizing filing	☐	☐
e. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐
III - PARTNERSHIP OR OTHER UNINCORPORATED ENTITY		
a. Articles of association, if any	☐	☐
b. If one partner is authorized to sign, resolution authorizing action is	☐	☐
c. Name and address of each participant, partner, association, or other	☐	☐
d. If application is for an oil or gas pipeline, provide information required by Item "I-f" and "I-g" above.	☐	☐

* If the required information is already filed with the agency processing this application and is current, check block entitled "Filed." Provide the file identification information (e.g., number, date, code, name). If not on file or current, attach the requested information.

(Continued on page 5)

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NOTICES

NOTE: This applies to the Department of the Interior/Bureau of Land Management (BLM).

The Privacy Act of 1974 provides that you be furnished with the following information in connection with the information provided by this application for an authorization.
AUTHORITY: 16 U.S.C. 310 and 5 U.S.C. 301.
PRINCIPAL PURPOSE: The primary uses of the records are to facilitate the (1) processing of claims or applications; (2) recordation of adjudicative actions; and (3) indexing of documentation in case files supporting administrative actions.
ROUTINE USES: BLM and the Department of the Interior (DOI) may disclose your information on this form: (1) to appropriate Federal agencies when concurrence or supporting information is required prior to granting or acquiring a right or interest in lands or resources; (2) to members or the public who have a need for the information that is maintained by BLM for public record; (3) to the U.S. Department of Justice, court, or other adjudicative body when DOI determines the information is necessary and relevant to litigation; (4) to appropriate Federal, State, local, or foreign agencies responsible for investigating, prosecuting violation, enforcing, or implementing this statute, regulation, or order; and (5) to a congressional office when you request the assistance of the Member of Congress in writing.
EFFECT OF NOT PROVIDING THE INFORMATION: Disclosing this information is necessary to receive or maintain a benefit. Not disclosing it may result in rejecting the application.

The Paperwork Reduction Act of 1995 requires us to inform you that:
The Federal agencies collect this information from applicants requesting right-of-way, permit, license, lease, or certifications for the use of Federal Lands.
Federal agencies use this information to evaluate your proposal.
No Federal agency may request or sponsor and you are not required to respond to a request for information which does not contain a currently valid OMB Control Number.

BURDEN HOURS STATEMENT: The public burden for this form is estimated at 25 hours per response including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to: U.S. Department of the Interior, Bureau of Land Management (1004-0189), Bureau Information Collection Clearance Officer (WO-630) 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

A reproducible copy of this form may be obtained from the Bureau of Land Management, Land and Realty Group, 1620 L Street, N.W., Rm. 1000 LS, Washington, D.C. 20036.

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COUNTY ROAD 136 REROUTE

ALTON, UTAH

PLAN OF DEVELOPMENT

Location:

County Road 136
Alton, Utah

For:

Alton Coal Development, LLC
463 N 100 W, Suite 1
Cedar City, UT 84720

By:

Boss Engineering & Surveying, LLC
1909 W. State Road, Suite 200
Pleasant Grove, UT 84062

April 09, 2008

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APPENDICES

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ROW PLAN OF DEVELOPMENT

1. INTRODUCTION

This ROW Plan of Development proposes to relocate the existing County Road 136 to accommodate active mining in the Private Land areas. County Road 136 is a public roadway used by both travelers and local residence in the area. (See Figure 1)

Measures identified in this Plan apply to work within the project area defined as the right-of-way (ROW), access roads, all work and storage areas, and other areas used during construction of the project. This Plan was developed in consideration of the U.S. Bureau of Land Management (BLM) ROW Plans of Development and Grants.

The ROW Plan (Plan) identifies measures to be taken by Alton Coal Development, LLC (Alton Coal) and its contractors (Contractor) to ensure strict conformance to BLM regulations and sound engineering design.

2. PURPOSE

Alton Coal Development, LLC proposes to mine coal in the area. The Private land that is leased by Alton Coal Development, LLC will be the active mining area. This road relocation moves County Road 136 outside of the active mining area to the west onto Public land that will not be immediately permitted for mining. This relocation provides for the health and safety of the public by preventing the interaction of large mining equipment with public traffic. It also provides for maximum recovery of the coal resource by eliminating the need for a public road within the boundary of the proposed mining area. Relocation of this road within the mining boundary would result in a coal loss of approximately 600,000 tons and it would be necessary to have a crossing of public traffic with the mine equipment. Based on the size of the mine equipment, there is a limited observation range for the operators and interaction between the public and this equipment would result in unsafe conditions.

3. DESIGN CRITERIA

The 3.1 mile long roadway is designed to have a 24ft gravel road surface within a 66ft ROW. (See Figure 2) Due to some steep areas, the cut and fill slopes will daylight outside of the 66ft ROW in some areas of the project. These areas are shown in Figure 3.

The road grades vary from 0.5% to 8% max. The clearing width for the roadway varies from 30ft to 100ft, with cut/fill slope ratios of 2:1 and 3:1, respectively.

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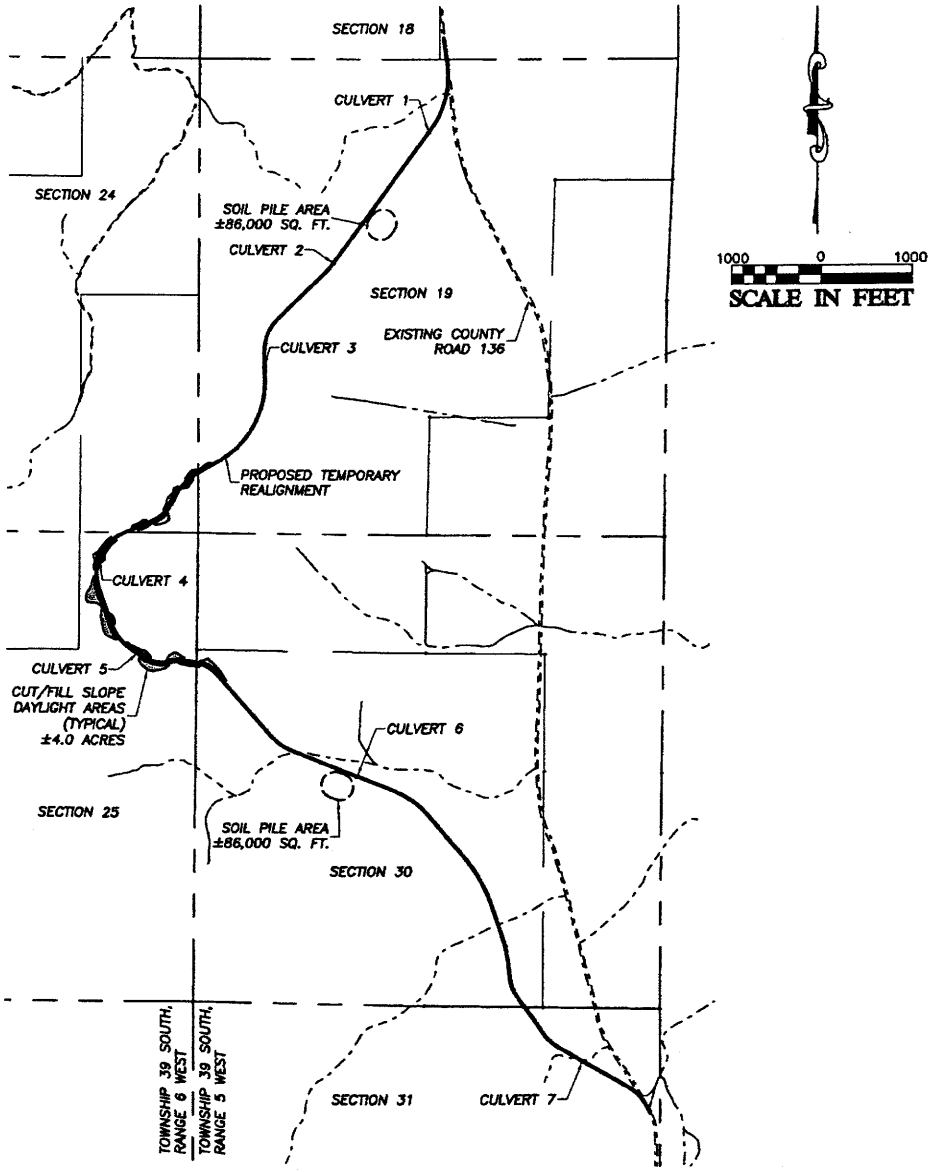

PLAN VIEW

SCALE: 1"=2000'

CULVERT DATA	
1	40 L.F. 18"ø CORRUGATED METAL PIPE
2	40 L.F. 18"ø CORRUGATED METAL PIPE
3	40 L.F. 18"ø CORRUGATED METAL PIPE
4	60 L.F. 8"ø CORRUGATED METAL PIPE
5	40 L.F. 24"ø CORRUGATED METAL PIPE
6	40 L.F. 18"ø CORRUGATED METAL PIPE
7	40 L.F. 18"ø CORRUGATED METAL PIPE

NO: 071011	DRAWN BY: SLB
DATE: 04/04/08	DESIGNED BY: WES
SHEET NO.:	CHECKED BY: WES

FIGURE 1
FOR
ALTON COAL DEVELOPMENT
COUNTY ROAD REALIGNMENT
ALTON, UT

BOSS ENGINEERING & SURVEYING

1909 W. STATE ST., SUITE 200, PLEASANT GROVE, UT 84062, (801) 763-8461 FAX (801) 763-8472

REVISIONS

NO	DESCRIPTION	DATE	BY

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Corrugated Metal Pipe (CMP) will be used for drainage structures at all wash areas and low spots within the project limits as shown in Figure 3.

The proposed roadway surface consists of 1-inch Type II Road Base gravel as recommended by the Kane County Standards. Approximately 9,000 cubic yards of gravel will be needed to meet the 6 inch minimum thickness required by the county. The top 3 inches of the road surface will be treated with calcium chloride to control dust.

Detailed drawings, including plan and profile sheets, along with construction and materials specifications are included in Appendix A.

4. CONSTRUCTION OF ROW FACILITY

The construction of this roadway will commence immediately after approval is granted by the Utah Division of Oil, Gas & Mining to begin mining. Construction of the roadway would disturb approximately 27 acres of land, including approximately 25 acres for the roadway construction right-of-way, 2 acres of temporary use areas (TUA), equipment storage site, and topsoil stockpile areas.

Construction duration for the roadway is estimated to take place within 3-4 months. The approval for the mine is expected to be provided within the next seven months. The BLM land authorization is requested for 10 years or longer.

The roadway will be constructed in conformance with the Kane County Standards and Specifications, FHWA requirements and in accordance with the ASHHTO guidelines on constructing and maintaining gravel roadways.

4.1 Flagging & Staking of ROW

Prior to construction of the roadway, a licensed surveyor will stake the centerline and ROW limits. Construction staking will include the staking of the cut and fill areas as well as the clearing limits. Contractor will be responsible for verifying that the limits of authorized construction work areas are staked prior to construction.

Pre-construction surveys and literature review were conducted to identify sensitive resources along the project route. Resources identified include: archeological sites and areas of potential geologic instability. All efforts have been made to avoid archeological areas as much as possible. Mitigation for sensitive areas that cannot be avoided is addressed in the environmental compliance plans.

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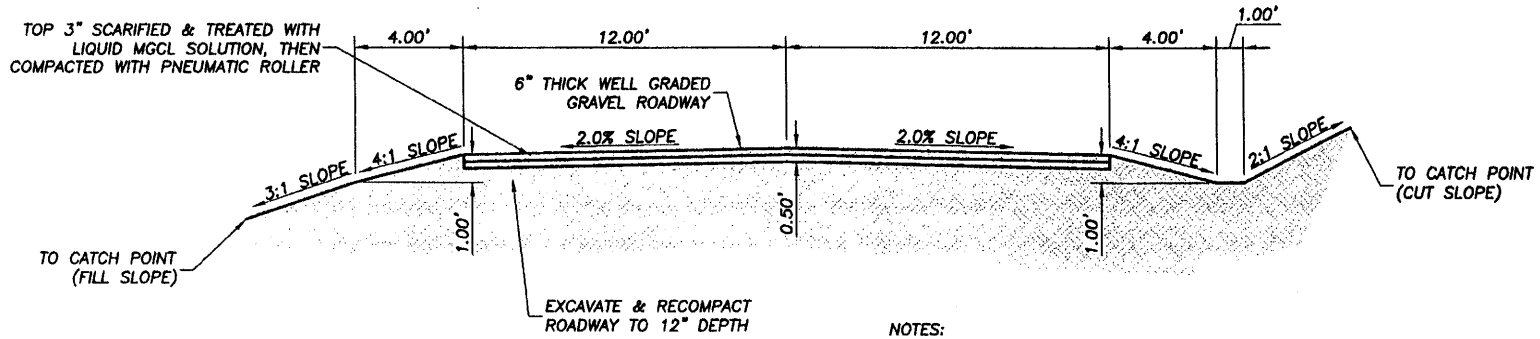

NOTES:

1. MOISTEN SCARIFIED SURFACE @ 0.75 GAL/SY PRIOR TO APPLYING LIQUID MAGNESIUM CHLORIDE SOLUTION.
2. MAGNESIUM CHLORIDE SOLUTION TO BE APPLIED SUCH THAT APPROXIMATELY 1.5 POUNDS OF DRY SOLIDS APPLIED PER SQUARE YARD.

TYPICAL ROADWAY SECTION

NOT TO SCALE

REVISIONS			
NO	DESCRIPTION	DATE	BY

BOSS ENGINEERING & SURVEYING
1909 W. STATE ST., SUITE 300, PLEASANT GROVE, UT 84062, (801) 763-8487 FAX (801) 763-8472

FIGURE 2
FOR
ALTON COAL DEVELOPMENT
COUNTY ROAD REALIGNMENT
ALTON, UT

JOB NO. 0771011	DRAWN BY: SLB	
DATE: 04/04/08	DESIGNED BY: WES	CHECKED BY: WES
SHEET NO.:		

4.2 Clearing and Grading of the ROW

Construction equipment will include trucks, loaders, various sized dozers, shovels and backhoes, graders, generators, and compaction machines. Most of the equipment to be used during ROW restoration will consist of dozers, blades, and backhoes.

The existing topsoil in the proposed roadway area is approximately 8 inches deep. The total volume of topsoil that will be removed is approximately 10,000 cubic yards. This topsoil will be removed and stockpiled within the limits of the proposed 66ft ROW. (See Figure 3)

The topsoil will later be used for reclamation when the roadway is abandoned.

Woody vegetation (trees, stumps, and brush) will be disposed of by hauling the material to a nearby landfill and/or making it available to the public for use as fire wood.

4.3 Earthwork

The roadway base will be made of suitable native material re-compacted to 95% maximum dry density. The roadway surface will be made of 6 inch gravel that will be obtained from an authorized mineral material site or pit. The contractor will obtain necessary permits and certification for the mineral material source if needed.

The unsuitable materials (i.e. oversize rocks, weak soils) will be spread alongside the roadway within the undisturbed areas of the 66ft ROW as shown in Figure 3.

Silt fences will be built to alleviate and/or control erosion and water pollution from disturbed soils.

4.4 Stabilization, Rehabilitation & Revegetation

Cleanup and restoration of the surface along the right-of-way and any TUAs will be performed by removing any construction debris and by performing final grading to the finished contour. Steps will be taken to minimize erosion, restore the natural ground contour, and account for road settling. Restoration seeding will be performed in accordance with BLM requirements.

5. OPERATION AND MAINTENANCE OF THE FACILITY

Due to the fact that this is a county roadway, the county is responsible for operation and maintenance of the roadway post construction. Alton Coal will assist the county in maintaining the roadway if needed.

Hauling equipment and materials will be done in accordance with Utah state requirements. Existing road and the ROW will be used for access. Existing road that will be used in

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conjunction with the ROW will be periodically maintained during construction. Maintenance will include blading throughout the construction period to keep road level and not rutted. Roadways will be maintained and kept open for public access throughout construction as prescribed by the respective authorizing agencies.

Alton Coal will be responsible for noxious weed control on project disturbed areas, temporary use right-of-way, and temporary use areas. Alton Coal will consult with the BLM Authorized Officer or field representative and local weed districts for acceptable weed control management techniques within the limits imposed in the grant stipulations.

6. TERMINATION AND ABANDONMENT

Prior to termination of the BLM Right-of-Way Grant, or any portion thereof, Alton Coal will contact the Authorized Officer to arrange for a pre-termination meeting and joint inspection of the right-of-way. This meeting and inspection will take place a minimum of 30 days prior to termination. The meeting and inspection will be held so that an agreement on an acceptable termination and rehabilitation plan can be reached. This plan will include, but not be limited to, abandonment and/or removal of facilities, drainage structures and/or surface material, re-contouring, replacing of topsoil, seeding, and monitoring. The Authorized Officer must approve the plan in writing. Alton Coal will relinquish all, or those specified portions, of the right-of-way in accordance with the termination plan.

7. MISCELANIOUS INFORMATION

7.1 Waste Disposal

Alton Coals Construction Inspectors will ensure that the Contractor implements the following waste disposal measures:

- No littering will be allowed on the right-of-way. Construction and operations sites will be maintained in a sanitary condition at all times and waste materials at these sites will be disposed of promptly at an appropriate waste disposal site. Waste is defined as all discarded matter including, but not limited to, human waste, discarded food, trash, garbage, refuse, oil drums, petroleum products, and equipment.

- The Contractor will dispose of excess or unsuitable materials at commercial disposal sites, commercial recycling centers, and disposal sites approved by BLM.

- The Contractor will comply with the hazardous waste disposal requirements of BLM.

- Human wastes, temporarily located within self contained facilities (portable toilets), will be removed from the right-of-way and disposed of in accordance with applicable laws and regulations.

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7.2 Safety Plan

Alton Coal and the Contractor will develop an Emergency Plan that will be followed by Alton Coal employees and the contractor in the event of an emergency at any roadway facility associated with this project. A Construction & Operations Emergency Plan will be written to be used during and after construction.

The Emergency Plan will address topics such as administrative issues, emergency planning, assignment of responsibilities, handling and evaluating emergency calls, responding to and controlling emergency situations, news media communications, restoration of service, obtaining and reporting emergency information, employee training, liaison with public officials, general public information program, location/inventory of roadway repair materials and equipment, and lists of emergency telephone numbers and key personnel.

This Emergency Plan will be updated and maintained in conformance with applicable DOT and State of Utah requirements.

7.3 Fire Prevention Plan

Construction Inspectors will ensure that the Contractor implements the following fire preventive measures:

- A closure order will be in effect for all areas under construction. All recreation activities, including hiking, camping, hunting, birding, horseback riding, etc, will be prohibited within the construction right-of-way. Alton Coal or the Contractor will post and sign the boundaries of the areas under construction in accordance with BLM specifications.

- No burning of brush or debris, and no campfires, lunch fires, or warming fires will be allowed on the right-of-way in accordance with the BLM fire restrictions.

- The Contractor will comply with any agency fire restrictions (e.g., welding, torch cutting, blasting).

- The Contractor will control fugitive dust in accordance with any applicable county, state, or federal permit requirements.

7.4 Temporary Use Permit (TUP)

In addition to the construction of the roadway and the 66 foot wide right-of-way, Alton Coal has identified temporary workspace areas where additional construction area width would be required for safe and efficient construction at road crossings, water body crossings, timber and boulder storage areas, steep sideslopes, at the bases or tops of steep ascent/descent areas, and at truck turnaround areas. The locations and sizes of the temporary workspaces identified by Alton Coal are depicted in the alignment sheets. Additional TUA will disturb approximately 4 acres.

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Appendix A

Plan & Profile Sheets
Detail Sheets

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EXHIBIT 2

886546

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

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
James W. Carter
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340
801-359-3940 (Fax)
801-538-5319 (TDD)

July 3, 1995

Rick Seibel, Regional Director
Jim Fulton, Denver Field Office Division Chief
U. S. Department of the Interior
Office of Surface Mining, Western Support Center
1999 Broadway, Suite 3320
Denver, Colorado 80202-5733

Re: Utah Section 733 Letter; Permitting of Roads

Gentlemen:

In light of the discussions and correspondence between the Division of Oil, Gas and Mining and the Office of Surface Mining ("OSM") since the informal conference in this matter, I am writing to clarify Utah's policy with regard to the permitting of public roads which may be used for, or related in some way to, coal mining and reclamation activities. Aside from the present disagreement regarding permitting road policy, the Utah Act and implementing regulations are approved by OSM and have been determined to be no less stringent than those of SMCRA. 30 U.S.C. § 1255.

Utah acknowledges that, under its approved definition of "affected area," there exists no blanket exemption from regulation for public roads. Utah recognizes, therefore, that some public roads may be subject to the permitting requirements of the Utah Act. Utah believes, however, that it is best suited to interpret its program, and to decide whether a particular road falls within the definition of "affected area." Since there is little substantive guidance in this area, the State will interpret its program by reference to such authorities as the court's decision **In Re Permanent (Flannery)** as well as conflicting IBLA decisions, such as **Harman Mining and W. E. Carter.**

Coal mining permits are required for all roads (public or private) that are constructed, reconstructed or used exclusively for coal mining and reclamation activities. Utah fully recognizes that the quantity of public use of a road is not the exclusive consideration to determine whether it is exempt from regulation. As a result, upon a finding by the State that a road is a bona-fide public road as defined by the approved regulations, Utah will rely on the definition of "surface coal mining operations" under U.C.A. § 40-10-3(18), 30 U.S.C. § 1291(28) and "affected area," U.A.C. Rule R645-100-

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200 and 30 C.F.R. §701.5, to determine whether an exemption from regulation is in order. If the operator can demonstrate to the satisfaction of the Utah regulatory authority that a particular road is not included in the definition of "surface coal mining operations," as explained in the pertinent preambles to the publication of the implementing federal rules and as interpreted by the courts, then Utah will not regulate the road.

Thus, a public road which was not constructed, reconstructed or used exclusively for coal mining and reclamation activities; i.e., a multiple use, open access public road, may not be required to be permitted if a) it was properly acquired by the governmental entity (not deeded to avoid regulation), b) it is maintained with public funds or in exchange for taxes or fees, c) it was constructed in a manner similar to other public roads of the same classification, and d) impacts from mining are not significant under the definition of "affected area" and "surface coal mining operations."

Utah recognizes that arrangements sometimes exist between coal companies and the entities which govern public roads used by such companies, whereby maintenance of the road is done in part by the coal companies. Utah believes that such arrangements are not the most important focus of inquiry; rather, coal mining usage and the associated impacts of such usage are the critical area of focus. A public road maintained by a coal operator or permittee should be examined as to:

1. whether the maintenance is occasioned primarily by the environmental impacts of coal mining operations on the road;

2. whether the maintenance is routine and similar to that which would be performed by the county or land management authority absent the agreement of the permittee or operator to do it; and

3. whether the maintenance agreement with the public entity is an arms-length arrangement, such that the essence of the requirement that maintenance be carried out with public funds is met.

For example, if a public land management agency stipulates that, as a condition of a special use permit, the permittee is responsible for maintenance of certain existing roads used by the operator, the fact that such roads are not maintained with public funds for the duration of the operation would not automatically subject those roads to regulation if the effect of mining use on them is relatively slight. Similarly, if state or local governments or public land management agencies require mine operators to construct road improvements or contribute road maintenance funds or services as a

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prerequisite for granting the permits and approvals necessary for the mining operation, the stipulation does not, by itself, render all such existing roads subject to regulation under SMCRA.

Utah believes that it, as the regulatory authority, is in the best position to make such determinations, and will decide, based upon these factors, whether such roads are public and whether the coal mining usage and impacts fall within the Utah program definitions of "surface coal mining operations" and "affected area."

We believe that this clarification addresses all of OSM's concerns while allowing the state of Utah to exercise its discretion in interpreting and administering its approved regulatory program. I trust this clarification will provide the basis for OSM to determine that Utah's implementation of its regulatory program is no less effective than the federal program, and that OSM may find the inquiry of the Section 733 letter satisfactorily answered.

We look forward to resolution of this issue and a continuing productive partnership with OSM in implementing Utah's coal regulatory program

Very truly yours,

James W. Carter
Director

jbe
cc: R. Uram, Director
Office of Surface Mining
H:733RESOL.LTR

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EXHIBIT 3

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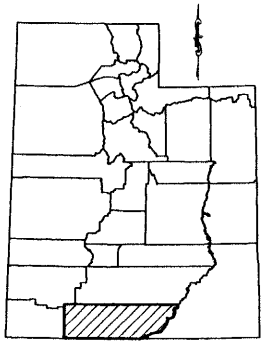
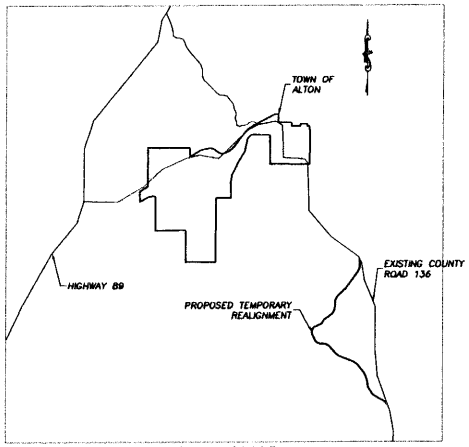
886546

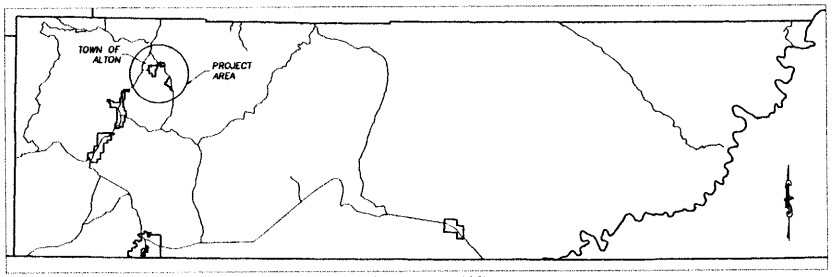
COUNTY ROAD 136 TEMPORARY REALIGNMENT
FOR
ALTON COAL DEVELOPMENT



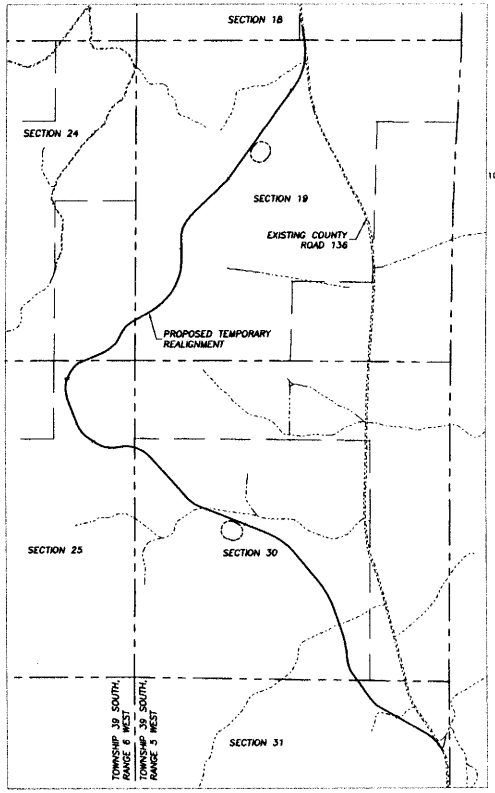
KEY MAP
NOT TO SCALE



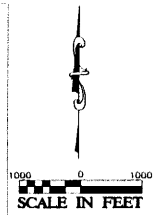
VICINITY MAP
NOT TO SCALE



KANE COUNTY MAP
NOT TO SCALE



PLAN VIEW
SCALE: 1"=1000'



ENGINEER

COMPANY: BOSS ENGINEERING & SURVEYING, LLC
ADDRESS: 1909 W. STATE ST., SUITE 200
PLEASANT GROVE, UT 84062

CONTACT: WILL SPITZENBERG
TELEPHONE: (801) 763-8467

DEVELOPER

COMPANY: ALTON COAL DEVELOPMENT, LLC
ADDRESS: 436 N. 100 W., SUITE 1
CEDAR CITY, UT 84720

CONTACT: CHRIS MCCOURT
TELEPHONE: (435) 867-5331

SHEET INDEX

CVR	COVER SHEET
IDX	PLAN AND PROFILE INDEX
PP1	PLAN AND PROFILE STA 8+00 THRU 35+50
PP2	PLAN AND PROFILE STA 35+50 THRU 63+50
PP3	PLAN AND PROFILE STA 63+50 THRU 91+50
PP4	PLAN AND PROFILE STA 91+50 THRU 119+50
PP5	PLAN AND PROFILE STA 119+50 THRU 147+50
PP6	PLAN AND PROFILE STA 147+00 THRU END
D1	DETAILS

NO.	DESCRIPTION	DATE	BY

REVISIONS

BOSS ENGINEERING & SURVEYING
1909 W. STATE ST., SUITE 200, PLEASANT GROVE, UT 84062, (801) 763-8467 FAX (801) 763-8472

COVER SHEET
FOR
ALTON COAL DEVELOPMENT
COUNTY ROAD REALIGNMENT
ALTON, UT

PROJECT NO: 8071011	DRAWN BY: S.L.B.	CHECKED BY: WTS
DATE: 2/29/08	DESIGNED BY: TWO	SHEET NO: CVR

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Div. of Oil, Gas & Mining

9-5-19-1
9-5-30-2

WHEN RECORDED, RETURN TO:

Jim Scarth, Esq.
Kane County Attorney
76 North Main Street
Kanab, Utah 84741

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0653
Amended Easement PAGE 1 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

AMENDED GRANT OF EASEMENT AND ASSIGNMENT AGREEMENT FOR COUNTY ROAD K3900

THIS AMENDED GRANT OF EASEMENT AND ASSIGNMENT AGREEMENT FOR COUNTY ROAD K3900 (this "**Agreement**") is made and entered into as of the 26 day of November, 2008 (the "**Effective Date**"), by and between **SINK VALLEY RANCH, LLC** ("**Grantor**"), and **ALTON COAL DEVELOPMENT, LLC**, a Nevada limited liability company, ("**Grantee" and "Assignor**") and Kane County, a political subdivision of the State of Utah ("**County**" and "**Assignee**"). Grantor, Grantee and County are sometimes hereinafter referred to as a "**Party**" and collectively referred to as the "**Parties**."

RECITALS

A. Grantor owns that certain real property located in Kane County, Utah, described on **Exhibit A** to this Agreement (the "**Sink Valley Ranch Property**").

B. Grantee intends to conduct coal mining activities on certain portions of the Sink Valley Ranch Property and following mining of these lands, seeks to locate a right of way for County Road K3900 on the Sink Valley Ranch Property.

C. Grantee and Kane County ("**County**") have entered into an agreement regarding the relocation and replacement of County Road K3900 ("**County Road K3900 Agreement**").

D. By Grant of Easement for County Road K3900 dated October 30, 2008 ("**Grant of Easement**"), Grantee acquired an easement and right of way from Grantor on the Sink Valley Ranch Property for assignment to the County for relocation and replacement of County Road K3900.

E. The Grant of Easement burdens that certain portion of the Sink Valley Ranch Property more particularly described and depicted as either Option A or Option B on the maps and diagrams attached at **Exhibit B** to this Agreement (the "**Easement Area**").

F. The Parties seek to amend the Grant of Easement to clarify the extent of the easement and right of way ("**Amended Grant of Easement**") and to provide for assignment of the Amended Grant of Easement from Alton Coal Development, LLC, to the County.

AGREEMENT

NOW, THEREFORE, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

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1. Amendment of Grant of Easement. Grantor hereby amends the Grant of Easement to include a perpetual, exclusive easement and right of way 66 feet in width for County Road K3900 over, across, upon and within either Option A or Option B or any area within the outlying boundaries of either Option A or Option B within the Easement Area, for the purpose of constructing, owning, operating, maintaining, repairing and replacing County Road K3900.

2. Assignment to County. Grantee hereby assigns the Amended Grant of Easement to the County. Grantor consents to the assignment of the Amended Grant of Easement to the County for re-establishment, construction, ownership, operation and maintenance of County Road K3900.

3. Construction and Use Requirements as Provided by the County Road K3900 Agreement. The County Road K3900 within the Easement Area shall be constructed by the County in accordance with County specifications and shall be owned by County for County Road K3900 which shall be operated and maintained by County without any cost, expense or obligation on the part of Grantor. Further, County has agreed to provide Grantor and Grantee/Assignor with thirty (30) days written notice prior to commencing construction within the Easement Area.

4. Obstructions. Grantor, by the terms of said agreement, shall not construct any fence, wall, or other barrier or structure of any kind on the Easement Area which would prevent, obstruct or impair County's use and enjoyment of the Easement Area and the operation of County Road K3900.

5. Term. The duration of this Agreement shall be perpetual unless all Parties mutually agree in writing to terminate this Agreement.

6. Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the Parties and their respective successors and assigns.

7. Notices. All notices, requests, demands or other communications hereunder shall be in writing and deemed given when delivered personally, when deposited to be sent via a nationally-recognized overnight courier keeping receipts of delivery, service prepaid or billed to sender, or on the day said communication is deposited with an overnight courier service, postage prepaid, addressed as follows:

To County: Kane County Commission
76 North Main Street
Kanab, Utah 84741

With a copy to: Jim Scarth, Esq.
Kane County Attorney
76 North Main Street
Kanab, Utah 84741

To Grantee: ALTON COAL DEVELOPMENT, LLC
463 North 100 West, Suite 1
Cedar City, Utah 84720

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Attention: Chris McCourt

With a copy to: Denise A. Dragoo, Esq.
Snell & Wilmer L.L.P.
15 West South Temple, Suite 1200
Salt Lake City, Utah 84101

To Grantor: Sink Valley Ranch, LLC
c/o C. Burton Pugh, Manager
533 North 650 East
Lindon, Utah 84042-1567

or to such other address as either Party may from time to time designate by notice in writing to the other Party. Rejection, refusal to accept delivery or inability to deliver due to changed address of which no notice has been given shall be deemed receipt by the addressee.

8. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Utah, without giving effect to its choice of law principles.

9. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed as an original but all of which together shall constitute one and the same instrument.

10. Entire Agreement. This Agreement supersedes all prior understandings, representations and agreements between the Parties with regard to the subject matter hereof and there are no other understandings, representations, warranties or agreements between them.

11. Amendment. Neither this Agreement nor any provision hereof may be changed, amended, modified, waived or discharged orally or by any course of dealing, but only by an instrument in writing signed by the Party against which enforcement of the change, amendment, modification, waiver or discharge is sought.

12. Authority. Each party hereto hereby represents, warrants and covenants unto the other that this Agreement has been duly authorized, executed and delivered by such party and constitutes the valid, legal and binding agreements and obligations of such party enforceable against such party in accordance with the terms hereof.

13. No Joint Venture. Nothing in this Agreement shall be construed to make the Parties partners or joint venturers or render any of the Parties liable for the debts or obligations of the other.

14. Agreement to Run with the Land; Running of Benefits and Burdens. All provisions of this Agreement touch, concern and run with the Sink Valley Ranch Property and Easement Area and are binding upon and inure to the benefit of the successors and assigns of Grantor and Grantee.

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0655
Amended Easement PAGE 3 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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Div. of Oil, Gas & Mining

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed b their duly authorized representatives effective as of the Effective Date.

Grantor:
SINK VALLEY RANCH, LLC

By: _____
Its: General Manager

Grantee:
ALTON COAL DEVELOPMENT, LLC

By: _____
Its: Manager

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0656
Amended Easement PAGE 4 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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Div. of Oil, Gas & Mining

STATE OF UTAH)
: ss.
COUNTY OF IRON)

The foregoing instrument was acknowledged before me this 3 day of December, 2008, by Christopher McCourt, Manager of ALTON COAL DEVELOPMENT, LLC, a limited liability company.

NOTARY PUBLIC
Residing at: Cedar City, UT

My Commission Expires:

5-25-09

NOTARY PUBLIC
JENNIFER STUCKI
7181 S. CAMPUS VIEW DR
WEST JORDAN, UTAH 84084
COMMISSION EXPIRES
MAY 25, 2009
STATE OF UTAH

STATE OF UTAH)
: ss.
COUNTY OF UTAH)

The foregoing instrument was acknowledged before me this 26 day of Nov., 2008, by C. Burton Pugh, General Manager of SINK VALLEY RANCH, LLC, a limited liability company.

NOTARY PUBLIC
Residing at: Pleasant Grove, UT

My Commission Expires:

August 12, 2012

NOTARY PUBLIC
SPENCER PRATT
Commission No. 578532
Commission Expires
AUGUST 12, 2012
STATE OF UTAH

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0657
Amended Easement PAGE 5 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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Div. of Oil, Gas & Mining

EXHIBIT A

Legal Description of the Sink Valley Ranch Property

Tract 9-5-19-1:

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 19: SW¼SE¼, E½SE¼, SE¼NE¼

containing 160.0 acres, more or less

Tract 9-5-30-2:

TOWNSHIP 39 SOUTH-RANGE 05 WEST, SLB&M
Section 30: All of Section Lot #1 (NW¼ NW ¼); NE¼ NW¼ ; N½ NE¼ ;
ALSO: BEGINNING 3.50 chains West of the East Quarter corner of Said Section 30, and running South 34° 34' West 22.64 chains to the 1/16 section line; thence West 2.64 chains to the Southwest corner of NE¼ SE¼ of Said Section 30; thence North 40.00 chains; thence East 20.00 chains; thence South 14.69 chains; thence southwesterly to the point of beginning

containing 217.64 acres, more or less

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0658
Amended Easement PAGE 6 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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EXHIBIT B

Map of the Easement Area

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0659
Amended Easement PAGE 7 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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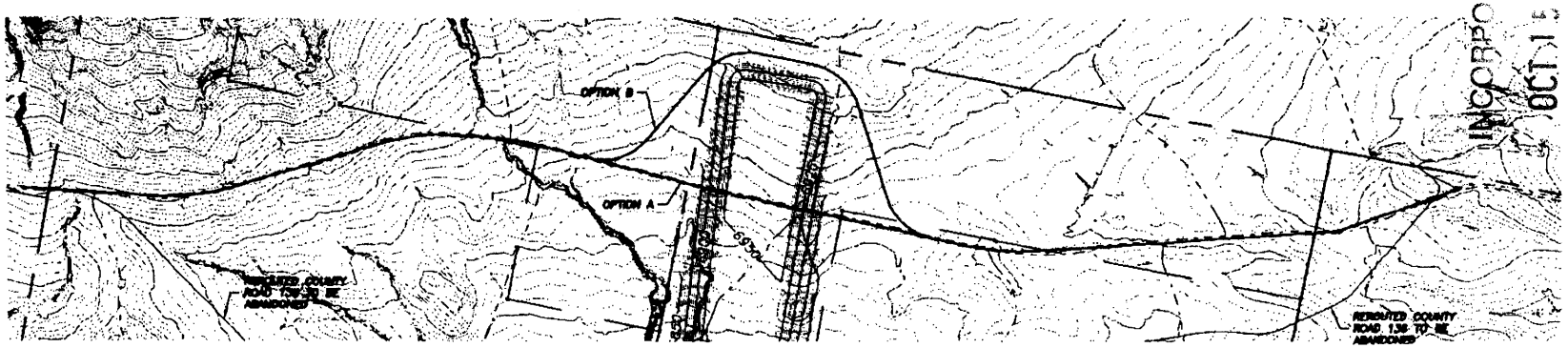
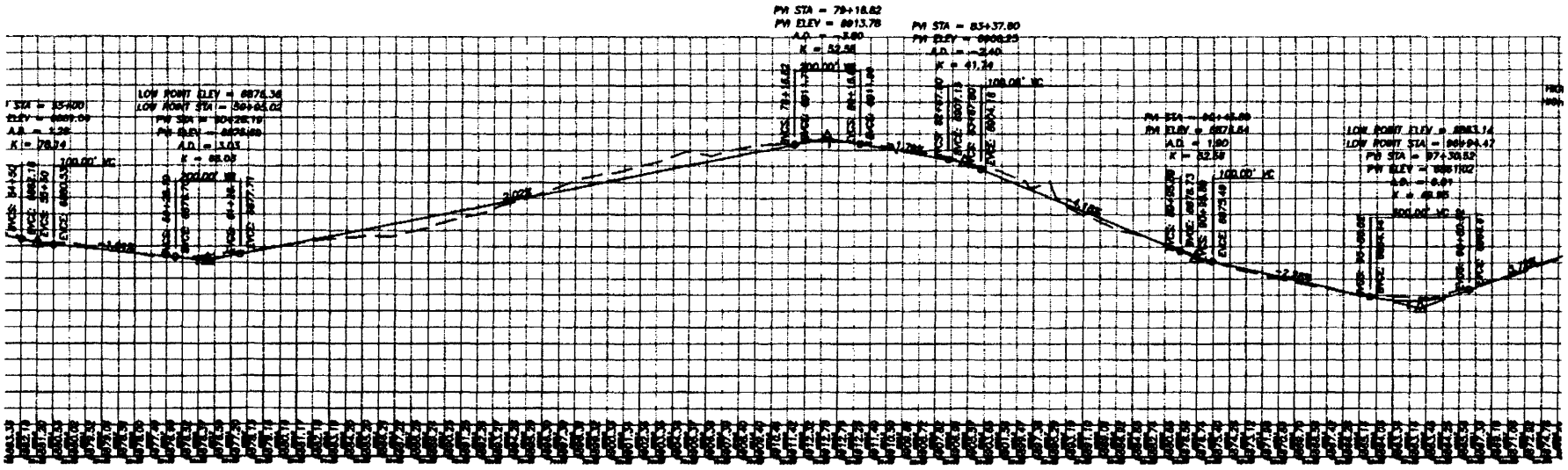
COUNTY ROAD 136 REESTABLISHMENT
FOR
ALTON COAL DEVELOPMENT

750 0 750
SCALE IN FEET



PLAN VIEW
SCALE: 1"=1800'



OPTION B PROFILE
HORIZONTAL SCALE: 1"=500'
VERTICAL SCALE: 1"=50'

ENTRY NO. 00142094
12/04/2008 04:40:56 PM B: 0360 P: 0660
Amended Easement PAGE 8 / 8
VERJEAN CARUSO, KANE COUNTY RECORDER
FEE $ 29.00 BY CHRIS MCCOURT

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REVISIONS			
NO	DESCRIPTION	DATE	BY

BOSS ENGINEERING & SURVEYING

ROAD REESTABLISHMENT
OPTIONS A & B
FOR
ALTON COAL DEVELOPMENT
COUNTY ROAD 136
ALTON, UT

PROJECT NO. 8071011	DRAWN BY SLB	
DATE 6/18/08	DESIGNED BY SLB	
SHEET NO. 1 OF 1	CHECKED BY VETS	

United States Department of the Interior
Bureau of Land Management

Environmental Assessment
UT-110-08-011

November 2008

Finding of No Significant Impact
And
Decision Record

Alton Road Relocation
UTU-83017

Location: Salt Lake Meridian, Kane County, Utah
Township 39 South, Range 5 West, Sections 18, 19, 30, 31;
Township 39 South, Range 6 West, Sections 24, 25.

Applicant/Address: Alton Coal Development, LLC
P.O. Box 463 North 100 West Suite 1
Cedar City, Utah 84720

U.S. Department of the Interior
Bureau of Land Management
Kanab Field Office
190 E. Center Street
Kanab, Utah 84741
Phone: 435-644-4300
FAX: 435-644-4350

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BLM

FINDING OF NO SIGNIFICANT IMPACT
AND
DECISION RECORD
Alton Road Relocation
EA-UT-110-08-011
UTU-83017

FONSI: Based on the analysis of potential environmental impacts contained in the attached environmental assessment, and considering the significance criteria in 40 CFR 1508.27, I have determined that the action will not have a significant effect on the human environment. An environmental impact statement is therefore not required.

DECISION: It is my decision to authorize the Alton Road Relocation #UTU-83017 as described in the Proposed Action from EA-UT-110-08-011. This decision is contingent on meeting all stipulations and monitoring requirements listed below.

SUMMARY OF THE SELECTED ALTERNATIVE: BLM is proposing to temporarily relocate Alton Road to the west of its current location for the life of the proposed coal mining operations. Once the mine is closed, the temporary route is to be reclaimed and the existing route of Alton Road will be reconstructed. The proposed road relocation would be approximately 3.1 miles long, have a 24-foot gravel road surface, and fall within a 66-foot-wide ROW impacting approximately 31 acres. Kane County would be responsible for road construction.

Identification of issues(s) for the assessment was accomplished by considering any resources that could be affected by implementation of one of the alternatives. Issues identified and addressed in the EA are:

- Native American Religious Concerns
- Livestock Grazing
- Vegetation
- Fish and Wildlife
- Soils
- Recreation
- Visual Resources
- Geology and Mineral Resources
- Paleontology

Stipulations: This decision is contingent on meeting the following stipulations and monitoring requirements which includes those identified by BLM IDT specialists in Appendix A.

(1) Air Quality: Watering will occur during construction to keep the dust down.

(2) Cultural Resources: The road has been routed to avoid all known cultural resource sites. Additionally, if cultural or Native American resources are discovered during construction, operations will cease, and a BLM authorized officer should be notified immediately.

(3) Floodplains: The road will be engineered to not impact any floodplains.

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(4) Invasive/Non-native species: Construction equipment will be pressure washed before coming to the project area and appropriate measures will be taken to reseed and rehabilitate areas of disturbance to decrease the establishment of cheatgrass.

(5) Threatened, Endangered, or Candidate Wildlife Species: The project will occur outside of dates for wintering Bald Eagle use (November 15–March 15) if eagles are present.

(6) Water Quality: BMPs such as sediment control structures including silt fences, erosion control mulching, etc. will be implemented to avoid impacts to water quality.

(7) Livestock Grazing: Wherever the alignment crosses a maintained fence, a new cattle guard and gate will be constructed so that remaining portions of the allotments would still be useable.

(8) Vegetation: Stipulations will be in place to require reseeding and rehabilitation of impacted areas after the completion of the project.

(9) Fish and Wildlife: Post-use reclamation will include reseeding of the road to provide for the re-establishment of wildlife habitat. Construction will occur outside of sage-grouse leking and nesting dates.

(10) Soils: Measures will be taken to prevent soil loss and erosion to the extent possible. Reseeding with species suitable for the site to provide soil site stability will be required after project completion.

(11) Visual Resources: Following landform contours will somewhat mitigate contrast.

(12) Paleontology: Although surface inventory did not locate substantial resources on the surface, they could occur below the present land surface. Ground disturbing activities in bedrock of the Dakota and Tropic formations will be spot checked by a qualified paleontologist or their authorized agent for substantial resources, which if found, will be scientifically collected by a qualified paleontologist or their authorized agent and reposited at the Utah Museum of Natural History.

(13) Lands and Access: The ROW will be temporary and the road will be removed and reclaimed upon termination of the mine.

RATIONALE FOR THE DECISION: The decision to authorize this right-of-way has been made in consideration of the environmental impacts of the Proposed Action. Granting of rights-of-way is authorized under Title V, Section 501 (1), of the Federal Land Policy and Management Act of 1976. The action is in conformance with the Kanab RMP signed October 31, 2008. Implementation of the Proposed Action will comply with all applicable federal and state laws, and local zoning and building ordinances during all phases of the project.

The proposed road relocation was selected to move Alton Road outside of the active mining area to the west onto land that would not be included in Alton Coal's pending permit application package. This relocation provides for more recoverable coal as well as for the health and safety of the public by preventing the interaction of large mining equipment with public traffic.

Kane County will construct, operate, and maintain the road in conformity with the approved plan of development that shall be included as part of the right-of-way grant. All companies involved with any aspect of the project will comply with the terms and conditions of the ROW grant and its attached stipulations.

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Potential resource conflicts, such as loss of vegetation, loss of AUMs, loss of sage grouse and mule deer habitat, and soil erosion were resolved through environmental commitments integral to the Proposed Action Alternative. These are fully described in the subject EA. These commitments and stipulations were developed during project planning involving all participants.

The No Action Alternative was not selected because public safety would be at a greater risk. It was determined that the road can be relocated with minimal impacts to the environment and is in the public interest.

Relevant issues were identified through the agency involvement process. During the preparation of this EA, the public was notified of the Proposed Action and a 30-day comment period was posted on the BLM's Utah Environmental Notification Bulletin Board on May 22, 2008 with a public scoping period through June 22, 2008 (30 days). Those individuals on the Kanab Field Office mailing list were sent a copy of the Notice of Intent and a public comment form. Two comments were received during this time. Due to the limited number of comments received, responses were not sent to commenters; instead the comments received have been addressed and responded to in the attached EA.

APPEALS: This decision shall take effect immediately on the date it is signed by the authorized officer, and shall remain in effect while any appeal is pending, unless the Interior Board of Land Appeals (IBLA) issues a stay. Any appeal of this decision must follow the procedures set forth in 43 CFR Part 4. Within 30 days of the decision, a notice of appeal must be filed in the office of the authorized officer at BLM Kanab Field Office, 318 North 100 East, Kanab, Utah 84741. If a statement of reasons for the appeal is not included with the notice, it must be filed with the IBLA, Office of Hearings and Appeals, U.S. Department of the Interior, 801 North Quincy St., Suite 300, Arlington, VA 22203 within 30 days after the notice of appeal is filed with the authorized officer.

If you wish to file a petition for stay pursuant to 43 CFR Part 4.21(b), the petition for stay should accompany your notice of appeal and should show sufficient justification based on the following four standards:

(1) The relative harm to the parties if the stay is granted or denied,

(2) The likelihood of the appellant's success on the merits,

(3) The likelihood of irreparable harm to the appellant or resources if the stay is not granted, and

(4) Whether the public interest favors granting the stay.

If a petition for stay is submitted with the notice of appeal, a copy of the notice of appeal and petition for stay must be served on each party named in the decision from which the appeal is taken, and must be served with the IBLA at the same time it is filed with the authorized officer.

A copy of the notice of appeal, any statement of reasons, and all pertinent documents must be served on each adverse party named in the decision from which the appeal is taken and on the Office of the Regional Solicitor, U.S. Department of the Interior, 6201 Federal Building, 125 South State Street, Salt Lake City, Utah 84138-1180, no later than 15 days after filing the document with the authorized officer and/or IBLA.

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Div. of Oil, Gas & Mining

Harry Barber, Field Office Manager

12/18/08
Date

Attachments: Figure 1
EA-UT-110-08-011

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Div. of Oil, Gas & Mining

BLM

United States Department of the Interior
Bureau of Land Management

Environmental Assessment (*UT-110-08-011*)
Case File # (UTU-83017)
November 2008

Alton Road Relocation Environmental Assessment

Location: ***Salt Lake Meridian, Kane County, Utah***
Township 39 South, Range 5 West, Sections 18, 19, 30, 31;
Township 39 South, Range 6 West, Sections 24, 25.

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CHAPTER 1: PURPOSE AND NEED

1.1 Introduction

This Environmental Assessment (EA) has been prepared to analyze and disclose the environmental consequences of the Alton Road re-route as proposed by Alton Coal Development, LLC (Alton Coal). The EA is a site-specific analysis of potential impacts that would result from the implementation of a proposed action or alternatives to the proposed action. The EA assists the Bureau of Land Management (BLM) in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of Finding of No Significant Impact (FONSI). If the decision maker determines that this project has "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a Decision Record may be signed for the EA approving the selected alternative, whether the proposed action or another alternative. A Decision Record, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in significant environmental impacts (effects) beyond those already addressed in the Kanab Field Office Resource Management Plan (RMP) October 2008.

1.2 Background

Alton Coal has a permit application package pending with the Utah Division of Oil, Gas, and Mining (DOGM) that, if approved, would permit coal surface mining operations on approximately 635 acres of private lands. Alton Coal has proposed the temporary relocation of Alton Road to accommodate active mining on the private lands through which the road currently passes. The estimated length of the re-route would be approximately 3.1 miles, all of which cross BLM-administered land. The width of the proposed right-of-way (ROW) requested for the project is 66 feet. Construction is anticipated to commence in spring 2009 depending on the timing of DOGM's final permitting decision. Figure 1 illustrates the location of the existing road in relation to the proposed road relocation: Township 39 South, Range 6 West, Sections 24 and 25; and Township 39 South, Range 5 West, Sections 18, 19, 30, and 31.

1.3 Need for the Proposed Action

The private land that is leased by Alton Coal would be the active mining area. This road relocation is needed to move Alton Road outside of the active mining area to the west onto land that would not be included in Alton Coal's pending permit application package. This relocation provides for more recoverable coal as well as for the health and safety of the public by preventing the interaction of large mining equipment with public traffic. Relocation of this road within the mining boundary is not ideal because it would result in crossing of public traffic with the mine equipment. Because of the size of the mine equipment, equipment operators have limited range of observation, and interaction between the public and this equipment would result in unsafe conditions.

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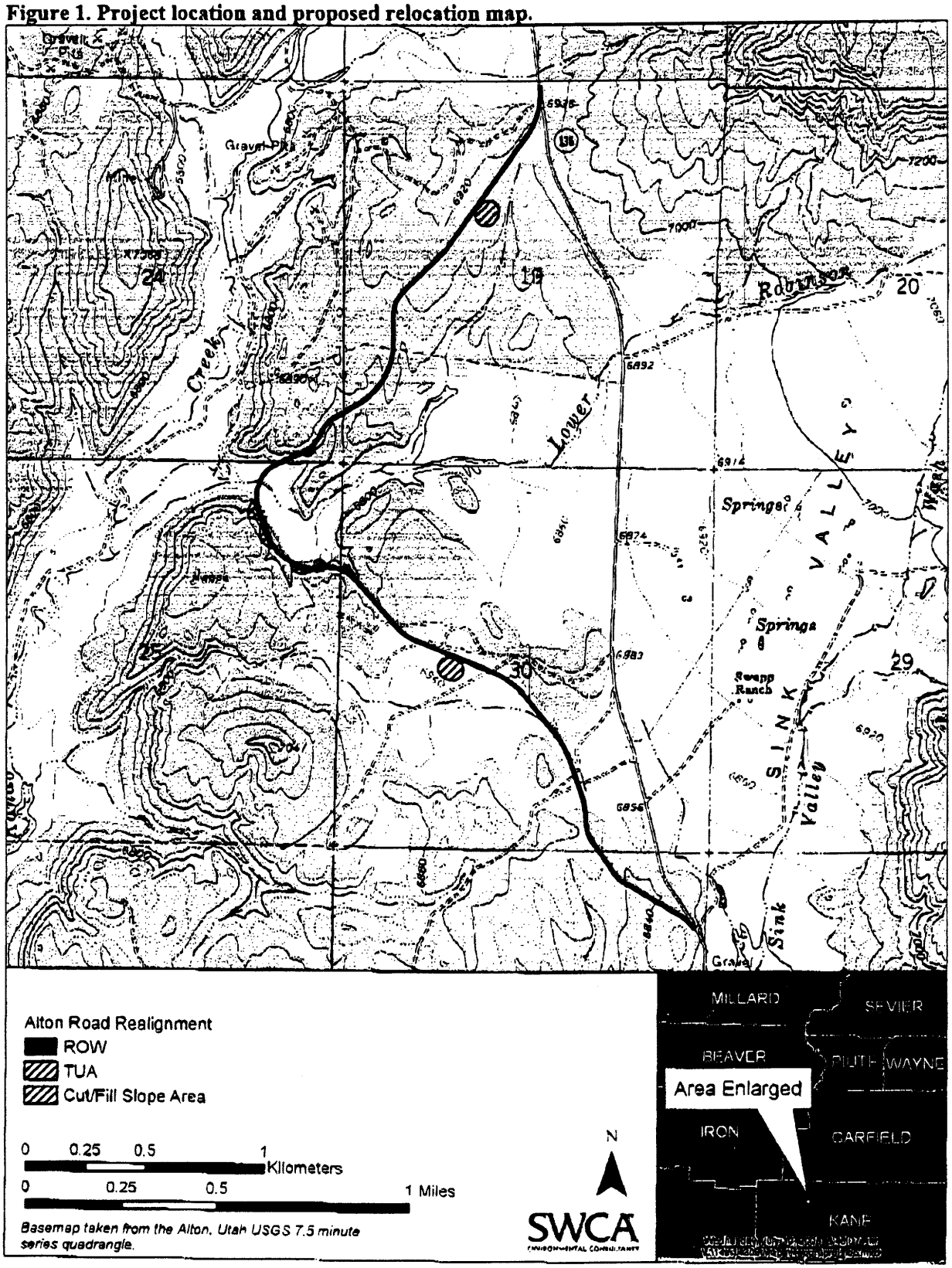
Figure 1. Project location and proposed relocation map.



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1.4 Purpose(s) of the Proposed Action

The Alton Coal Plan of Development proposes to temporarily relocate the existing Alton Road to accommodate active mining and safe public and mine-related travel in the private land areas. Alton Road is a public roadway used by both travelers and local residents in the area (see Figure 1). Measures identified in the Alton Coal Plan of Development apply to the projected work, which is defined as the ROW, access roads, all work and storage areas, and other areas used during construction of the project.

1.5 Conformance with BLM Land-use Plan(s)

The Proposed Action Alternative described below would be in conformance with all decisions in the Kanab RMP. That document states that, "although established corridors exist, this does not preclude the location of transportation and transmission facilities in other areas if environmental analysis indicates that the facilities are compatible with other resource values and objectives." Although the Proposed Action and alternative(s) are not specifically mentioned in the plan, they are consistent with its objectives, goals, and decisions as they relate to Lands and Realty Program goals and objectives.

The BLM is considering approval of road relocation consistent with the Kanab RMP for making public lands available for ROWs in order to provide access for more recoverable coal. Coal mining is recognized in the Kanab RMP as an appropriate use of public lands, and it provides management direction to support energy development as part of the National Energy Policy Act of 2005. The BLM will consider approval of the proposed road relocation in a manner that avoids or reduces impacts on resources and activities as identified in Appendix A, the Interdisciplinary Team Analysis Record Checklist (ID checklist), and prevents unnecessary or undue degradation of the public lands.

1.6 Relationship to Statutes, Regulations, or Other Plans

The Proposed Action would be consistent with federal regulations and state and local laws, and would be consistent with local management plans to the maximum extent possible. The following activity plans and documents also direct the Kanab Field Office management in the analysis area, including the selection of an alternative from this EA. This action is consistent with federal laws and regulations, including the granting of ROWs authorized by Title V of the Federal Land Policy and Management Act (43 U.S.C. 1761-1771). Other laws that must be considered are as follows:

- National Environmental Policy Act of 1969, as amended (43 U.S.C. § 4231)
- National Historic Preservation Act of 1966, Public Law 89-665, as amended in 1992
- Migratory Bird Treaty Act, as amended through Public Law 107-136, Jan 24, 2002
- Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.)
- Endangered Species Act of 1973
- Bald Eagle Protection Act of 1940

The Proposed Action would also be consistent with the Standards for Rangeland Health of BLM Lands in Utah (BLM 1997), with applicable Native American Trust policies, and with state and

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local plans, programs, and policies to the extent practical within federal law, regulation, and policy.

1.7 Identification of Issues

The ID checklist (Appendix A) provides a brief description of the affected environment, including critical elements that could be impacted to a level requiring further analysis.

Resources identified in the ID checklist as "not present in project area" include Areas of Critical Environmental Concern, Environmental Justice (low income or minority populations), Prime and Unique Farmlands, Wild and Scenic Rivers, Wilderness, and Non-WSA Lands with Wilderness Characteristics.

Resources identified in the ID checklist as "present in project area but not impacted by the proposed project" are listed below. Resources not being impacted also include those for which mitigation measures or best management practices (BMPs) would be implemented as part of the proposed action to avoid impacts.

Air Quality: The ID checklist indicated that impacts to air quality would be minimal but that watering should occur during construction for dust abatement.

Cultural Resources: Cultural resource inventories have been completed (see reports U-05-MQ-1568-b,p and U-07-BL-0969-b). The Alton Road has been designed to avoid all known cultural resource sites, and no sites would be impacted.

Floodplains: The ID checklist indicates that engineering of the Alto Road should be done so that floodplains are not impacted.

Invasive, Non-native Species: The ID checklist indicates that equipment should be pressure washed before coming to the project area, and appropriate measures should be taken to reseed and rehabilitate areas of disturbance to decrease the likelihood of the establishment of cheatgrass (*Bromus tectorum)* and other non-native, invasive species.

Threatened, Endangered, or Candidate Plant Species: The ID checklist indicates that no Threatened, Endangered, or Candidate Plant Species are known to exist within the project area.

Threatened, Endangered or Candidate Wildlife Species: The ID checklist indicates that the area has limited use by Bald Eagles (*Halieaeetus leucocephalus*), but that the project should proceed outside of dates for eagle wintering use (November 15 to March 15) if eagles are present.

Wastes: There are no anticipated impacts relating to solid or hazardous wastes.

Water Quality (drinking/ground): No impacts to water quality would be anticipated with this action. Mitigation would need to take place as part of standard operating procedures to ensure water quality is not impacted.

Wetlands/Riparian Zones: The ID checklist indicates that a limited riparian area is crossed by the proposed road on BLM land.

Rangeland Health Standards and Guidelines: The ID checklist indicates that some loss of rangeland would occur as a result of this action; however, it is probably not enough to quantify it as an impact.

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Woodland/Forestry: No significant impact to woodland/forestry is expected. Some removal of pinyon (*P. edulis* or *P. monophylla*) and juniper (*Juniperus* spp.) trees may take place, but this does not pose a great impact.

Lands/Access: Because this is only a temporary ROW and the Alton Road would be removed and reclaimed at the termination of the mine, no impacts to lands or access to public lands are anticipated.

Fuels/Fire Management: No impact to fuels and fire management is expected. The added road would serve as a fire break and provide quicker access to more areas for fire suppression.

Socioeconomics: Rerouting of the Alton Road would have no socioeconomic impact. Access would be maintained.

Resources identified in the checklist as "present and potentially impacted by the proposed project" are, Native American Religious Concerns, Livestock Grazing, Vegetation, Fish and Wildlife, Soils, Recreation, Visual Resources, Geology/Mineral Resources, and Paleontology. These resources are described in detail in Chapters 3 and 4.

1.7.1 Native American Religious Concerns

- Consultation regarding this road would be initiated, but because no sites would be impacted, no Tribal comments are anticipated.

1.7.2 Livestock Grazing

- The impact area would take in part of several grazing allotments, reducing the acreage available for livestock grazing, thereby reducing the number of Animal Unit Months (AUMs) available.

1.7.3 Vegetation

- Vegetation in the project area would be impacted, and stipulations would be included in the ROW grant requiring the reseeding and rehabilitation of impacted areas after the completion of the mining project.

1.7.4 Fish and Wildlife

- There is limited mule deer use in the area, however the proposed project lies within critical mule deer summer range. Greater sage-grouse (*Centrocercus urophasianus*; hereafter referred to as sage-grouse) have brooding habitat in the project area and a lek adjacent to area; Alton Road relocation has the potential to impact use by grouse in winter and during nesting and brooding. The lek is approximately 2,018 feet from the proposed ROW.

1.7.5 Soils

- Measures should be taken to prevent soil loss and soil erosion to the extent possible. Reseeding with species suitable for the site should be required after project completion to provide soil site stability

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1.7.6 Recreation

- Alton Road relocation would displace recreation along the existing alignment of Alton Road, and would move discordant sights and sounds closer to recreationists using the western portions of the project area.

1.7.7 Visual Resources

- The project area lies within Visual Resource Management (VRM) Class IV area, which allows major modification of the existing character of the landscape. The proposed project would temporarily introduce new contrasts in form, line, texture, and color to the landscape. Following landform contours would somewhat mitigate contrast.

1.7.8 Geology/Mineral Resources

- A gravel source would need to be identified and site-specific NEPA analysis performed if the gravel source is located on federal lands.

1.7.9 Paleontology

- Up to 70% of the proposed re-route is over Tropic and Dakota formation outcrops. These units have yielded highly significant fossils in the immediate area, including vertebrate microfossil sites (Dakota), plesiosaurs, articulated fish remains, and exceptionally well-preserved specimens of rare invertebrate fossils. Any ground disturbing activity could damage fossil resources or lead to loss of important contextual data.

1.8 Summary

This chapter has presented the purpose and need of the proposed project, as well as the relevant issues (i.e., those elements of the human environment that could be affected by the implementation of the proposed project). In order to meet the purpose and need of the proposed project in a way that resolves the issues, the BLM has analyzed the Proposed Action and No Action Alternative. These alternatives are presented in Chapter 2. The potential environmental impacts or consequences resulting from the implementation of each alternative are then analyzed in Chapter 4 for each of the identified issues.

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CHAPTER 2: DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

2.1 Introduction

This EA discloses the environmental impacts of the Proposed Action and the No Action Alternative. The analysis of the No Action Alternative is considered and analyzed to provide a baseline for comparison of the impacts of the Proposed Action.

Alternative routes were considered, but they were eliminated from consideration and detailed analysis. Alternatives included variations in location and distance of the routes. These alternatives were eliminated from further analysis because of constraints, including impacts to environmentally sensitive areas, cultural resources, public safety, and topography. See Section 2.4 below.

2.2 Alternative A–Proposed Action

BLM is proposing to temporarily relocate Alton Road to the west of its current location for the life of the proposed coal mining operations. Once the mine is closed, the temporary route would be reclaimed and the existing route of Alton Road would be reconstructed. Appendix B shows the proposed alignment and describes in greater detail the activities associated with the proposed road relocation. The proposed road relocation would be approximately 3.1 miles long, have a 24-foot gravel road surface, and fall within a 66-foot-wide ROW. The 66-foot-wide ROW would fall 33 feet on either side of the centerline. Due to some steep areas, the cut and fill slopes would terminate outside of the 66-foot-wide ROW in some areas of the project for a total of 1.85 acres. The road grades vary from 0.5% minimum to 8% maximum with cut and fill slope ratios of 2:1 and 3:1, respectively. Kane County would be responsible for road construction and would likely put the project out for bid if the Proposed Action is approved.

2.2.1 Preconstruction Activities

Approximately 2 acres would be needed for each temporary use area for a total of 3.96 acres (Figure 1). No permanent structures or facilities are anticipated as part of the road relocation. It is anticipated that construction would take approximately 3 to 4 months and the road would be needed for approximately 5 to 10 years.

2.2.2 Design Criteria

The 3.1-mile-long roadway is designed to have a 24-foot gravel road surface within a 66-foot-wide ROW (Appendix B). Corrugated metal pipe would be used for drainage structures (culverts) at all wash areas and low spots within the project limits as shown in Appendix B. The proposed roadway surface consists of 1- inch, Type II road base gravel as recommended by the Kane County standards. Approximately 9,000 cubic yards of gravel would be needed to meet the 6-inch minimum thickness required by the county. The top 3 inches of the road surface would be treated with calcium chloride to control dust.

2.2.3 Construction of ROW Facility

The construction of this roadway would commence immediately after approval by the Utah DOGM to begin mining. Construction of the roadway would disturb approximately 31 acres of

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land: approximately 25 acres for the roadway construction ROW, itself, 2 acres for cut and fill slopes, and 4 acres for temporary use areas, equipment storage sites, and topsoil stockpile areas.

2.2.3.1 Flagging and Staking of the ROW

Prior to construction of the roadway, a licensed surveyor would stake the centerline and ROW limits. Construction staking would include the staking of the cut and fill areas as well as the clearing limits.

2.2.3.2 Clearing and Grading of the ROW

Construction equipment would consist of trucks, loaders, dozers of various sizes, shovels and backhoes, graders, generators, and compaction machines. Most of the equipment to be used during the ROW restoration would consist of dozers, graders, and backhoes.

The existing topsoil in the proposed roadway area is approximately 8 inches deep. The total volume of topsoil that would be removed is approximately 10,000 cubic yards. This topsoil would be removed and stockpiled within the limits of the proposed 66-foot-wide ROW. The topsoil would later be used for reclamation when the roadway is discontinued.

2.2.3.3 Earthwork

The roadway base would be made of suitable, native material re-compacted to 95% maximum dry density. The roadway surface would be made of 6-inch gravel that would be obtained from an authorized mineral material site or pit. The unsuitable materials (i.e., oversize rocks and weak soils) would be spread alongside the roadway within the undisturbed areas of the 66-foot-wide ROW as shown in Appendix B. Silt fences would be built to alleviate and/or control erosion and water pollution from disturbed soils.

2.2.3.4 Temporary Use Areas

In addition to the construction of the roadway and the 66-foot-wide ROW, Alton Coal has identified two temporary workspace areas (2 acres each) where additional construction area width would be required for safe and efficient construction at road crossings, water body crossings, timber and boulder storage areas, steep sideslopes, the bases or tops of steep ascent/descent areas, and truck turnaround areas. The locations and sizes of the temporary workspaces identified by Alton Coal are depicted in the alignment sheets. The temporary use areas would disturb approximately 4 total acres.

2.2.3.5 Stabilization, Rehabilitation, and Revegetation

Cleanup and restoration of the surface along the ROW and any temporary use areas would be accomplished through the removal of any construction debris and final grading to the finished contour. Steps would be taken to minimize erosion, to restore the natural ground contour, and to account for road settling. Restoration seeding would be performed in accordance with BLM requirements in the ROW grant.

2.2.4 Operation and Maintenance of the Facility

Because the proposed road relocation would be maintained by the county, Alton Coal would assist the county in maintaining the proposed roadway if needed. The hauling of equipment and

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materials would be done in accordance with Utah state requirements. The existing road and ROW would be used for access as a haul route. Approximately 3,500 feet of the existing road are located on public lands and would remain open and maintained by the county. The existing road on private lands would be closed to public access. The existing road that would be used in conjunction with the proposed ROW would be periodically maintained during construction by blading in order to keep the road level and not rutted.

2.2.5 Termination and Abandonment

Prior to termination of the BLM ROW grant, or any portion thereof, Alton Coal would contact the Authorized Officer to arrange for a pre-termination meeting and joint inspection of the proposed ROW. This meeting and inspection would take place a minimum of 30 days prior to termination. The meeting and inspection would be held so that an agreement on an acceptable termination and rehabilitation plan can be reached. This plan would include, but not be limited to, the abandonment and/or removal of facilities, drainage structures, and/or surface material; re-contouring; replacing of topsoil; seeding; and monitoring. The Authorized Officer must approve the plan in writing. Alton Coal would relinquish all, or those specified portions, of the proposed ROW in accordance with the termination plan.

2.3 Alternative B–No Action

NEPA requires a No Action Alternative, which is defined in the Council on Environmental Quality's regulations as a continuation of present conditions (40 CFR §1502.14). The analysis of the No Action Alternative provides important baseline information for the decision maker and the public.

The No Action Alternative would deny a ROW for the road. With this alternative, the BLM would not approve a ROW for the road and the applicant would not be allowed to place the road on public lands. The BLM has an obligation to allow utility and transportation development if the environmental consequences are not irreversible or severe. If the ROW grant is not approved, the applicant can (and generally would) submit a new ROW application that corrects the flaws in the original. The ROW process is designed to overcome the No Action Alternative by not accepting the ROW application as complete, until such problems are solved or mitigated in the application. If the No Action Alternative were selected, Alton Coal would have to use the existing road. However, the current road would not be suitable because of various safety issues.

2.4 Other Action Alternatives and Alternatives Considered but Eliminated from Further Analysis

Alton Coal considered alternative routes, but they were eliminated from consideration and detailed analysis. Additional alternatives included variations in location and distance of the routes. These alternatives were eliminated from further analysis because alternative routes would have resulted in greater impacts to cultural and environmental resources in the area.

One alternative route location was located several hundred feet east of the currently proposed route and crossed the private mine area. Though this route was over 3,000 feet shorter in length, it impacted several archaeological sites that could not be avoided.

Another alternative route considered was close to the currently proposed route, but it also impacted archaeological sites and would have required a significant amount of fill to cross

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Lower Robinson Creek. Ultimately this alignment was adjusted farther to the west to take advantage of the natural topography so that the road would be lower in elevation when it crossed Lower Robinson Creek and therefore would minimize the impact to the area. This alignment was also modified to specifically avoid each archeological site, and, after modifications it became the Proposed Action.

The other alternative eliminated proposed that the road be kept within the Surface Mining Control and Reclamation Act permit boundary, which is the only private property Alton Coal has lease rights to in the immediate area. The re-route in this situation would begin immediately south of Lower Robinson Creek. This route would turn east along the creek for approximately 2,000 feet and would then proceed along the eastern edge of the planned mining pits. The pits are planned to extend close to the property boundary along this eastern edge, but, with the addition of this road, Alton Coal would lose an area of coal at least 166 feet wide by approximately 1 mile in length. The width of this block of coal is based on the restrictions on mining activity within 100 feet of a public road ROW (per Surface Mining Control and Reclamation Act) and the 66-foot-wide ROW for the road.

In addition to the coal loss, public safety would be of substantial concern. The road re-route would have to cross an active mine haul road at least once in order to proceed along the east side of the pits. This crossing would be dangerous and most likely would require fulltime crossing guards to control public traffic through this area. The active mine haul road would have large equipment trafficking regularly across it. Because of the equipment size, the operators of this equipment have a limited observation range from the cab and cannot stop quickly.

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CHAPTER 3: AFFECTED ENVIRONMENT

3.1 Introduction

The affected environment of the Proposed Action and No Action Alternative was considered and analyzed by a BLM interdisciplinary team as documented in the ID checklist (Appendix A). The ID checklist indicates which resources of concern are present in the project area and which would be impacted to a degree that requires detailed analysis. Critical Elements of the Human Environment are those elements that are subject to the requirements specified in statute, regulation, or executive order, and must be considered in all EAs (BLM 2005). Section 3.3 describes the resources that were identified as those that would be potentially impacted by the Proposed Action.

3.2 General Setting

The proposed re-route of the Alton Road is located to the southeast of Alton, Utah, which has a population of 134 (USCB 2000). The site is approximately 7,000 feet above sea level and is in the Colorado Plateau Semi-Desert physiographic province (Bailey 1995). Ranching and grazing are the primary land uses in the area. The two dominant vegetation types are pinyon-juniper woodland and mixed mountain shrubland. The road traverses habitat for mule deer (*Odocoileus hemionus*), sage-grouse, and elk (*Cervus canadensis*) (BLM 2008).

The average maximum temperature is 60.2°F and the average minimum temperature is 31.0°F. The average precipitation is 16.4 inches per year, and the average total snowfall is 83.3 inches per year (WRCC 2008).

3.3 Critical Elements of the Human Environment and Other Resources Brought Forward for Analysis

3.3.1 Native American Religious Concerns

Many Native American tribes maintain that they are descendents of the peoples who once occupied the area managed by the Kanab Field Office, including the Southern Paiute, Navajo, Hopi, Ute, and Zuni tribes. Because of this traditional connection, many of these tribes hold a deep interest in the area's resources and the uses of those resources.

General areas, specific species, and/or specific sites could be important to contemporary Native American tribes for their traditional uses or for their sacred or religious/spiritual associations. Archaeological remains of prior Native American cultures, especially burials, rock art, and habitations, are often religiously or spiritually significant to current tribes. In addition, the physical resources of the area can be important for both traditional uses (e.g., continuing traditional gathering of ceremonial or subsistence vegetation and use of areas for ceremonial purposes) and for association with use by prior Native American cultures (e.g., springs and water sources or concentrations of other important resources). These areas and sites are generally not known or discussed outside of the affected community, but they may be present in the decision area.

According to the Kanab RMP, consultation would be required to identify and protect specific sites or areas. Consultation for this project was initiated by the BLM in September 2008 and completed on October 30, 2008.

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3.3.2 Livestock Grazing

Grazing allotments encompass 30.46 acres within the boundaries of the project area (see Table 3-1 and Figure 2). There are five grazing allotments that fall within the project area and one area that has no allotted AUMs. The allotments that fall within the boundaries are Alton, Isolated Tracts, Robinson Creek, Syler Knoll, and Upper Sink Valley.

Table 3-1. Grazing Allotments

Allotment	Total Acres in Allotment	Acres of Allotments in Project Area	Percent of Total Allotment
Alton	156	7.87	5.04%
Isolated Tracts	1,813	0.65	0.04%
Robinson Creek	515	6.69	1.30%
Syler Knoll	496	9.24	1.86%
Upper Sink Valley	6,279	4.71	0.08%
Un-allotted	N/A	1.30	N/A
Total	**9,259**	**30.46**	**8.32%**

3.3.3 Vegetation

Alton Road occurs in the semiarid foothills of the Colorado Plateau Semi-Desert physiographic province (Bailey 1995). Vegetation communities and the acres of each vegetation type found in the project area are listed in Table 3-2 and Figure 3.

Table 3-2. Vegetation Types

Vegetation Type	Acres
Pinyon-juniper/Mountain Brush	1.79
Pinyon-juniper/Sagebrush	5.07
Rabbitbrush	0.51
Riparian	0.06
Sagebrush/Grass	6.66
Sagebrush/Grass (treated)	15.94
Other (road and pastureland)	0.43
Total	**30.46**

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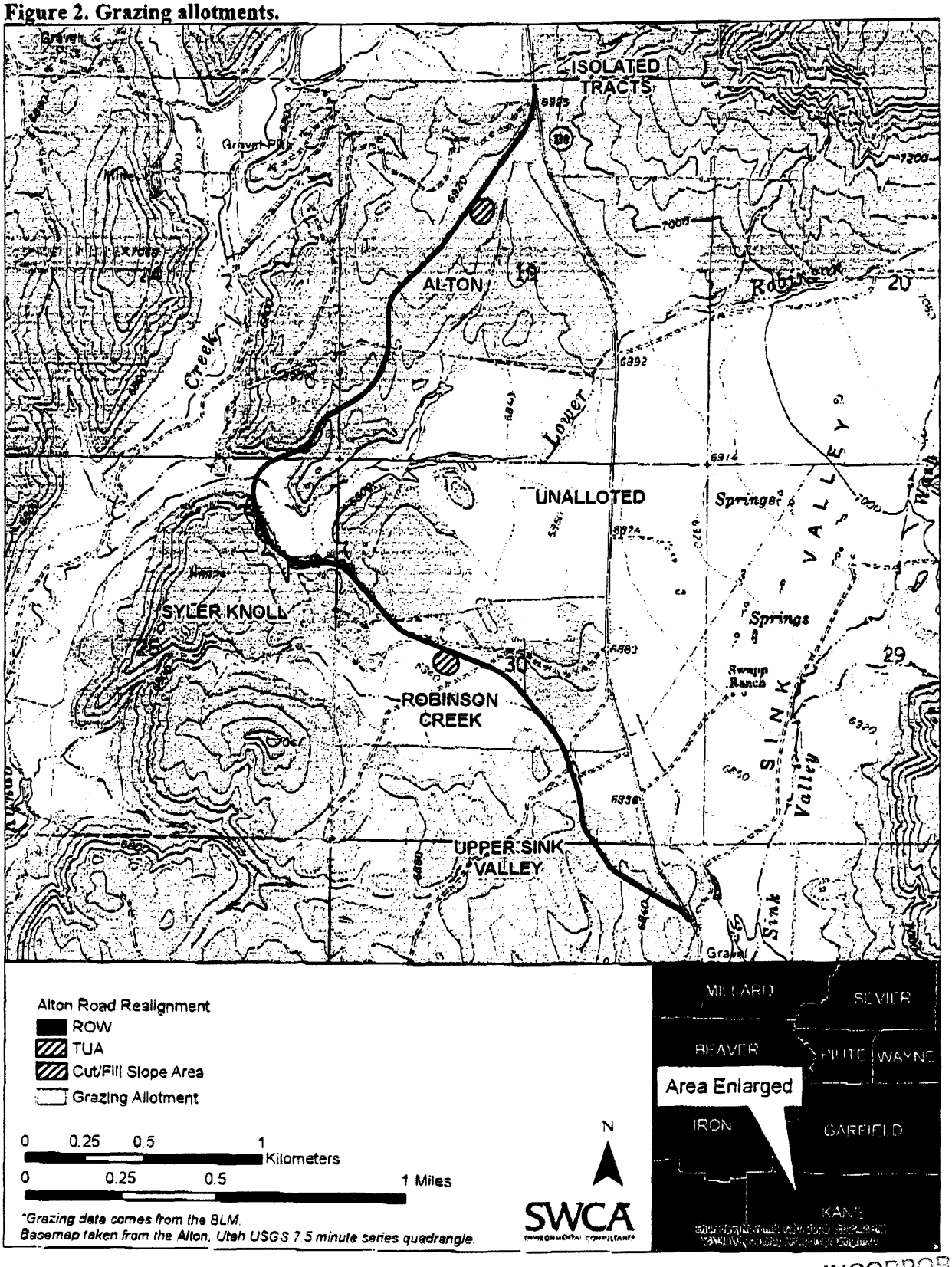
Figure 2. Grazing allotments.



*Grazing data comes from the BLM.
Basemap taken from the Alton, Utah USGS 7.5 minute series quadrangle.

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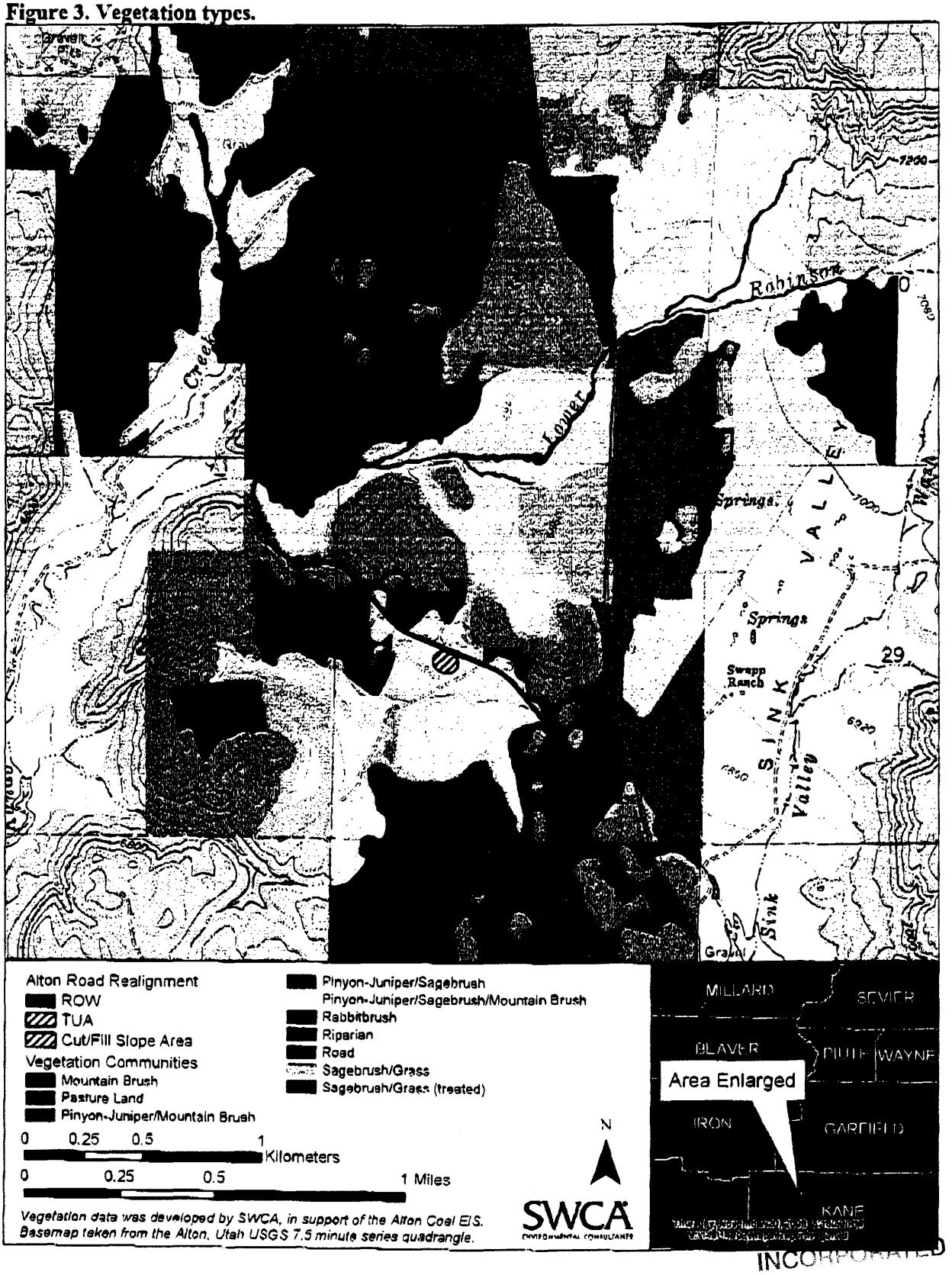
Figure 3. Vegetation types.



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Pastureland and other roads are also found in the project area. Mean annual precipitation in the Town of Alton was approximately 16 inches from 1928 to 2006, and mean annual temperature for this same time period was 60.2°F (WRCC 2005). The Colorado Plateau ecoregion receives most of its precipitation in the form of snow during the winter months; summers are generally hot and dry (WRCC 2005). These climate conditions encourage the growth of plant species that are physiologically adapted to withstand drought and heat.

Vegetation within the project area is managed by the BLM in accordance with the Kanab RMP Record of Decision signed October 31, 2008 (BLM 2008). Specifically, the area's vegetation is managed with the goal of improving wildlife habitat, increasing forage production for livestock grazing, providing watershed protection, and reducing soil loss.

3.3.4 Fish and Wildlife

Sage-grouse are found in scattered populations throughout Utah, with the exception of most of the Colorado Plateau in the southeastern portion of the state (UDWR 2002). The sage-grouse is an herbivore and insectivore that is dependent on sagebrush habitat (*Artemisia* species, especially *A. tridentata*). Sage-grouse require an understory of grasses and forbs and associated wet meadow areas (Bosworth 2003). Occupied habitat areas have declined approximately 60% from historic levels (BLM 2008). Sage-grouse population declines are currently attributed to habitat loss, habitat fragmentation, and reduced habitat quality.

One of the greatest threats to sage-grouse is the direct loss of the sagebrush steppe environment due to pinyon-juniper encroachment, mineral development, and invasive plants (UDWR 2005a). A sage-grouse lek is located adjacent to public lands near the southern end of the project area (Figure 4). Changes in function of the sagebrush steppe, including disrupted fire regimes and the lack of herbaceous understory, reduce the usable values of the existing habitat (UDWR 2005a). There are currently 145,900 acres of sagebrush steppe in the Kanab Field Office management area which represents 26% of this area.

Crucial summer mule deer habitat is located in the western portions of Kane County and throughout Garfield County (Figure 4). Mule deer are migratory animals, moving seasonally between summer and winter ranges. Mule deer usually summer at high elevations and winter at low elevations. Loss and degradation of lower elevation winter range can limit mule deer populations (UDWR 2005a). Loss of winter range is a limiting factor on the western portions of the project area (UDWR 2005c, UDWR 2005d). Throughout the remainder of the decision area, habitat decline is threatening the health of the mule deer herds (UDWR 2005e, UDWR 2006b, UDWR 2005f, UDWR 2005g). The cause of habitat decline is generally associated with decadent sagebrush steppe and encroaching pinyon-juniper communities.

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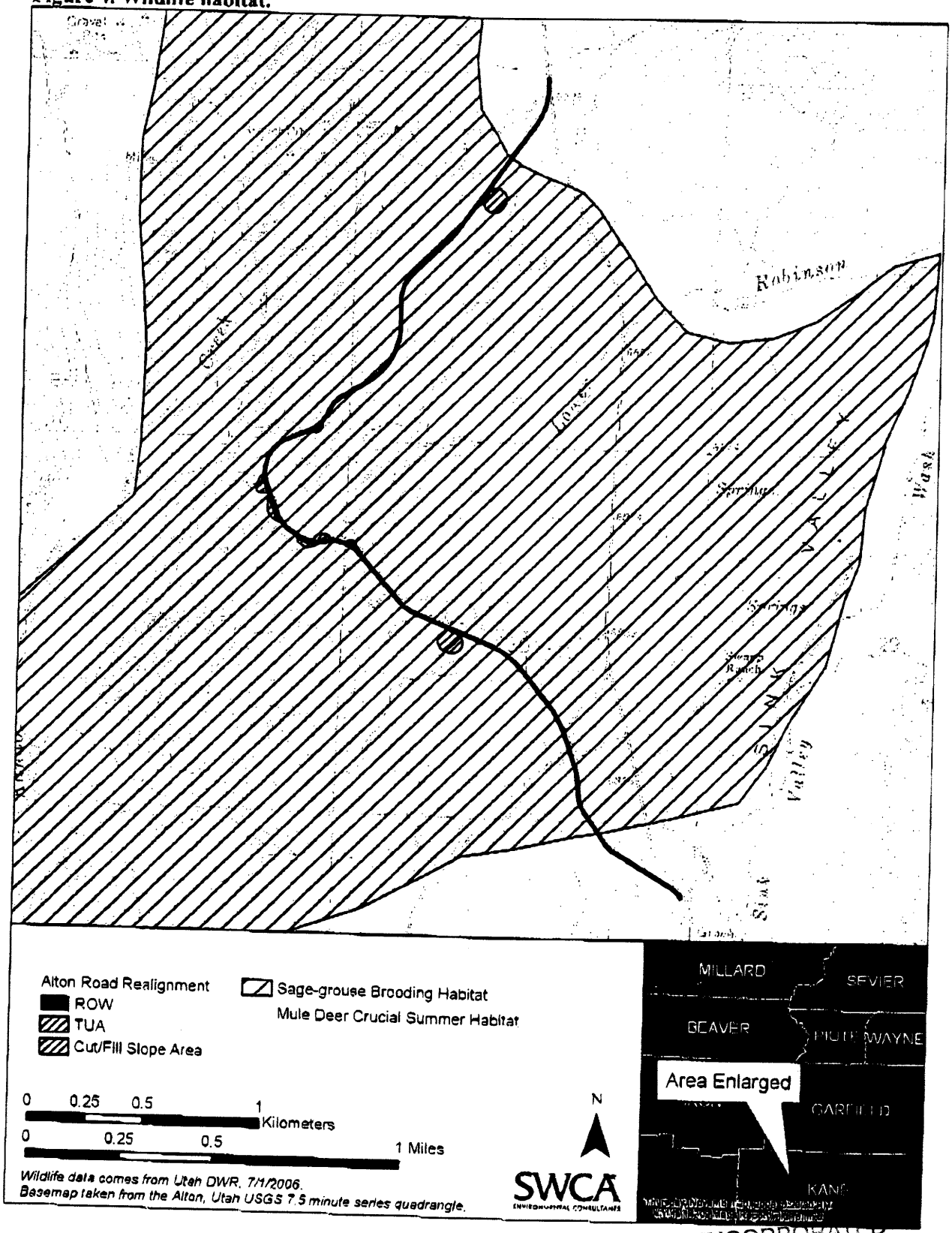
Figure 4. Wildlife habitat.



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3.3.5 Soils

NRCS soils data are currently unavailable for the area; however, data are in the process of being gathered and should be available in approximately winter of 2009. Soils information included in the Mine Permit Application for the Alton Coal Project, July 1987 (UII 1987) was used to determine soil mapping units, soils series, and soil characteristics for the project area. Soils in this area vary widely in their characteristics. Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. Dominant soil types in the project area and their acreages are listed in Table 3-3 and Figure 5.

Table 3-3. Soil Types

Soil Type	Slope	Depth	Soil Type	Acres in Project Area	Percent of Project Area
16B	5%–9%	20"–40"	Rolling uplands	8.43	27.7%
16C	10%–19%	20"–40"	Rolling uplands	10.50	34.5%
16pB	5%–9%	40"–60"	Low ridges, uplands	5.00	16.4%
81A	0%–5%	72+"	Alluvial valley	1.52	5.0%
S16D	20%–29%	10"–20"	Upland sideslopes	5.01	16.4%
Total				**30.46**	**100.0%**

3.3.6 Recreation

Southwest Utah offers a variety of recreation opportunities in varying terrain, including mountains, desert, forests, canyons, rivers, and lakes. Major tourist attractions are Bryce Canyon National Park, the Dixie National Forest, the Grand Staircase–Escalante National Monument, and two scenic highways. A number of developed and semi-developed campgrounds, day use areas, and trailheads exist for recreational use in the general area.

BLM lands within the project area limit OHV use to designated trails. The BLM manages lands within the study area for the following recreation activities: OHV touring; hunting; fishing; photography; picnicking; hiking; backpacking; camping; viewing nature, wildlife, and geologic features; and participating in competitive events. No recreational trails or facilities are located on BLM lands within the project area.

The Kanab RMP estimates participation in 65 types of recreation activities within their field office, and that during the past several years, participation in some recreational activities has substantially increased in the KFO. More recreationists participate in OHV riding than in any other form of recreation use. Big game hunting also receives comparatively high levels of use, both in the number of participants and the number of visitor days. (BLM 2008).

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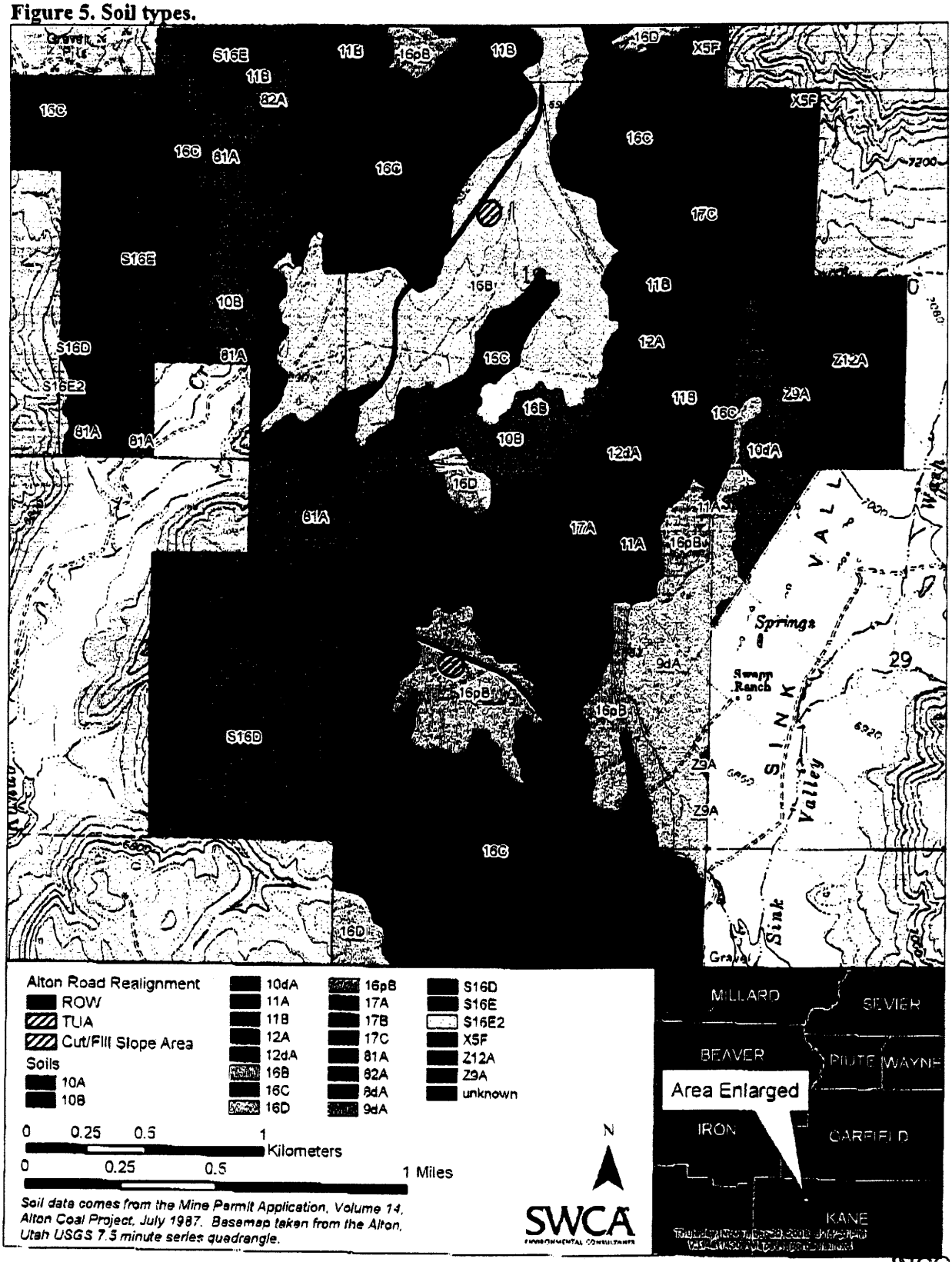
Figure 5. Soil types.



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3.3.7 Visual Resources

Visual resources are composed of landform (topography and soils), vegetation, bodies of water (lakes, streams, and rivers), and human-made structures (roads, buildings, and modifications of the land, vegetation, and water). These elements of the landscape can be described in terms of their form, line, color, and texture. Normally, the more variety of these elements there is in a landscape, the more interesting or scenic the landscape becomes, if the elements exist in harmony with each other. The BLM manages landscapes for varying levels of protection and modification, giving consideration to other resources values and uses and the scenic quality of the landscape.

The current VRM inventory identifies the existing scenic values in the decision area. The inventory includes an evaluation of scenic quality, analysis of sensitivity, and delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four VRM inventory classes. The inventory classes represent the relative value of the visual resources. Class I and Class II resources are the most sensitive, Class III resources are moderately sensitive, and Class IV resources are the least sensitive (Table 3-4).

Table 3-4. VRM Inventory Class Definitions

Classification	Classification Objective
I	To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
II	To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
III	To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
IV	To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

Source: BLM Handbook H-8410-1, Visual Resource Inventory

The proposed road relocation would occur solely in Visual Resource Class IV, as prescribed by the Kanab RMP.

3.3.8 Geology/Mineral Resources

The geology of the project area primarily consists of Cretaceous-age strata of the Dakota Formation, Tropic Shale, and Straight Cliffs Formation. Younger Tertiary deposits of sand and gravel mantle the landscape and cap some of the knolls. In some localities Dakota Formation coal deposits have burned, resulting in the baking of the surrounding rock and creating a hard "clinker" type deposit known as burnt shale.

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3.3.9 Paleontology

The Proposed Action is sited entirely over outcrops of the Late Cretaceous Dakota Formation, Tropic Shale, and Holocene alluvium. Although the Holocene units have no fossil potential, the bedrock units have high potential to yield significant vertebrate fossil resources, and both have the highest Potential Fossil Yield Classification (PFYC) rating of five. A paleontological survey was conducted on February 8, 2006 to identify resources in the area. No significant resources were identified in this survey, but potential exists, particularly in the Tropic Shale, for significant subsurface resources to be present.

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CHAPTER 4: ENVIRONMENTAL IMPACTS

4.1 Introduction

This chapter analyzes the impacts of the Proposed Action to those resources described in Chapter 3, Affected Environment. It should be noted that the road relocation would be temporary and would be moved to its original location after mining is completed.

4.2 Direct/Indirect Impacts

4.2.1 Alternative A–Proposed Action

4.2.1.1 Native American Religious Concerns

Past Native American consultation efforts, as well as the consultation efforts associated with the preparation of the Kanab RMP, have not identified specific areas or resources of Native American religious concern in the project area. These types of resources include traditional cultural properties, treaty-based subsistence use areas, traditional use areas, and rights of access. Sources of water, specifically springs, are potential areas of Native American religious concern. In addition, contemporary Native American tribes are sensitive to disturbance and loss of archaeological sites, because many tribes maintain that these sites are evidence of their ancestors and could therefore be religiously or spiritually significant.

Although no cultural resource areas fall within the project area, prehistoric cultural resource sites could be identified during road construction near the proposed road relocation. Native American consultation did not result in any concern from the tribes. Table 5-1 provides details regarding the tribes' responses. If sites are discovered during construction, activities would cease and the tribes would be notified.

4.2.1.2 Livestock Grazing

Issue: Impact of forage loss on levels of livestock grazing (AUMs)

The impact area would fall within five different grazing allotments and a small portion of land that is not assigned to any specific allotment. Impacts to livestock consist of surface disturbance associated with road construction that would remove 30.46 acres of vegetation. That amounts to approximately three AUMs of total forage for all of the allotments. Table 4-1 illustrates the acres of impact to each of the allotments from the Proposed Action.

Table 4-1. Acres of Impact to Grazing Allotments under the Proposed Action

Allotment	ROW/Permanent	Temporary Use Areas	Cut/Fill Slope	Percent of Project
Alton	5.90	1.97	0	26%
Isolated Tracts	0.65	0	0	2%
Robinson's Creek	4.72	1.97	0	22%
Syler Knoll	7.40	0	1.84	30%
Upper Sink Valley	4.71	0	0	15%
Un-allotted	1.29	0	0.01	4%

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Total	**24.67**	**3.94**	**1.85**	**100%**

The greatest amount of impact would occur on the Syler Knoll, Alton, and Robinson's Creek allotments, which account for 78% of the proposed road relocation. In general terms, an AUM is the amount of forage needed to sustain one cow and her calf for one month. Assuming AUMs are calculated at 10 acres of vegetation per AUM, the removal of 30.46 acres of vegetation would result in a loss of approximately three AUMs due to the road relocation (BLM 2006).

4.2.1.3 Vegetation

Issue: Impact of acres of vegetation lost

Impacts to vegetation in the project area would occur from surface disturbance related to the proposed road construction. Table 4-2 shows the acres of impacts, resulting from the Proposed Action, that would occur under each vegetation type.

Table 4-2. Acres of Impact to Vegetation under the Proposed Action

Vegetation Type	ROW/Permanent	Temporary Use Areas	Cut/Fill Slope	Percent of Project Area
Pinyon-juniper/Mountain Brush	1.65	0	0.14	5.88%
Pinyon-juniper/Sagebrush	3.36	0	1.71	16.64%
Rabbitbrush	0.51	0	0	1.67%
Riparian	0.06	0	0	0.20%
Sagebrush/Grass	4.69	1.97	0	21.86%
Sagebrush/Grass (treated)	13.97	1.97	0	52.33%
Other (pastureland and road)	0.43	0	0	1.41%
Total	**24.67**	**3.94**	**1.85**	**100%**

Sagebrush/grass (including treated areas) and pinyon-juniper/sagebrush have the highest acreage and would therefore receive the greatest impact from vegetation removal for construction. A limited amount of riparian area would also be crossed by the proposed road at Lower Robinson Creek. To minimize impacts, reseeding and rehabilitation of the impacted area would be required after the completion of the project.

4.2.1.4 Fish and Wildlife

Issue: Impacts of habitat loss on sage-grouse brooding and mule deer

Because sagebrush steppe is the main habitat type for sage-grouse brooding habitat and mule deer crucial summer habitat, acres of impact to this type of vegetation have been used to analyze impacts resulting from the Proposed Action. Surface disturbance from the Proposed Action would result in the direct removal of vegetation and therefore lead to a decrease in habitat used by sage-grouse and mule deer. Impacts from surface disturbance to sage-grouse include 26.16 acres and for mule deer 30.46 acres. With 145,900 acres available for sage-grouse habitat in the Kanab Field Office, the acres of habitat disturbance would constitute approximately 0.02%to both species. Although the acres of physical disturbance is small, the lek is also known as one of

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the most isolated leks in the Kanab Field Office. For this reason, there is potential to affect sage-grouse breeding and brood rearing habitat beyond these acres due to the change in traffic patterns and use from where the road is now.

Table 4-3. Acres of Impact to Wildlife Habitat under the Proposed Action

Wildlife Species	Row/ Permanent	Temporary Use Areas	Cut/Fill Slope	Total	Acres in KFO	Percent of Acres Impacted by Project
Sage-grouse Brooding Habitat	20.37	3.95	1.85	26.16	145,900	.02%
Mule Deer Crucial Summer Habitat	24.67	3.95	1.85	30.46	145,900	.02%

4.2.1.5 Soils

Issue: Impacts to soil composition from surface disturbance

Reclamation-limiting factors (i.e., factors that prevent soils from being fully reclaimed following surface disturbance) are found in each of the project area's soils. In reclamation-limited soils, one or more factors make site reclamation difficult in semiarid environments; these factors are alkalinity, droughty soils, salinity, sodium adsorption, and rooting depth. Alkalinity refers to higher (i.e., more basic) soil pH, which generally limits plants' ability to become established. Droughty soils have low water-holding capacities due to their porosity. Salinity refers to the amount of salt within soils that can be dissolved in surface waters. The sodium adsorption ratio refers to the amount of sodium that can be held by soils and influence nutrient uptake. Rooting depth risk refers to shallow soils where there is a risk of poor reclamation success due to a shallow rooting depth in the rooting zone.

Reclamation-limited soils are difficult to reclaim or restore. Once they are disturbed, the impact is usually long lasting (BLM 1993). Using the above-listed, reclamation-limiting factors, the reclamation-limiting features of each soil feature risk was classified as high, moderate, or low. Table 4-4 indicates the limiting factors for each of the soil types found in the project area and that is used to define the soil types.

Table 4-4. Soil Reclamation Factors

Soil Code	Acres in Project Area	Percent of Project Area	Alkalinity Risk	Droughty Soil Risk	Salinity Risk	Excess Sodium Risk	Rooting Depth Risk
16B	8.43	27.7%	Low	Low	Low	Low	High
16C	10.50	34.5%	Low	Low	Low	Low	High
16pB	5.00	16.4%	Low	Low	Low	Low	High
81A	1.52	5.0%	Low	Moderate	Low	Low	High
S16D	5.01	16.4%	Low	High	Low	Low	High

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Total	**30.46**	**100.0%**					

Some soil loss would occur from surface disturbance during road construction activities. Soil would be cleared and disturbed during grading and gravel placement. Soil types 16B and 16C have the highest acreage but the reclamation risk factors are all low except for rooting depth risk which is high for both soil types. Soil types S16D and 81A are less wide spread in the project area but would likely result in greater impacts due to high and moderate droughty soil risk, respectively.

4.2.1.6 Recreation

Issue: Impacts to visitor use from road relocation

Impacts to recreation from the Proposed Action would be minimal. The current road location does not provide much pubic access to the east of the road alignment. Most of the access to public lands lies to the west and the new alignment would still allow access to these public lands. Recreationists would be exposed to activities associated with road development and mining operations to the north and east, including more traffic and more noise. Impacts of surface disturbance to mule deer habitat would occur on 30.46 acres, thereby impacting hunters seeking hunting activities in and adjacent to these areas by limiting the number of mule deer using these areas.

4.2.1.7 Visual Resources

Issue: Changes to the landscape from new road construction

The proposed road lies completely within a VRM Class IV area, which allows major modification of the existing character of the landscape. Because the entire road relocation lies within a VRM Class IV area, the road relocation is consistent with the VRM goals and objectives of the Kanab RMP.

New road construction would change the landscape and introduce new contrasts to form, line, and texture. Changes to the landscape include visually intrusive color, line, and form contrasts that would be created by the presence of construction vehicles and equipment, and from exposed-soil surface disturbances in the middle and foreground. Color contrast-related and line contrast-related visual impacts would also be produced temporarily in the ROW. A moderate to strong edge effect would be created between exposed soil and the surrounding vegetation, particularly noticeable from middle ground slopes. Alton Coal would follow landform contours to mitigate contrast.

4.2.1.8 Geology/Mineral Resources

Issue: Use of federal gravel resources from obtaining road base on federal land

Impacts to geology and minerals would result if up to 9,000 cubic yards of gravel, road base or burnt shale were used from federal lands in the project area, thereby making the resource unavailable for future use. At this time the exact source of the material is unknown, although, if materials were to come from federal lands, new material pits would need to be identified and processed for use on the project. Because Kane County would be responsible for road

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construction, if the Proposed Action is approved, the county would likely put the project out for bid, and the source of material determined at that time.

4.2.1.9 Paleontology

Issue: Disturbance to paleontological resources from surface-disturbing activities exposing paleontology

Up to 70% of the proposed re-route is over Tropic Shale and Dakota Formation outcrops. These units have yielded highly significant fossils in the immediate area, including vertebrate microfossils (in the Dakota Formation), plesiosaurs, articulated fish remains, and exceptionally well-preserved specimens of rare invertebrate fossils. Potential impacts to paleontological resources from the surface-disturbing activities outlined in the Proposed Action would include resource damage and loss of important contextual data during construction and grading.

4.2.2 Mitigation Measures:

The proposed road relocation would move the existing road to a new location outside of the proposed mine. This would be a temporary relocation for the duration of the mine and is contingent on the mine being approved by DOGM. The road would be replaced in the same location when the mining is completed.

The following mitigation measures would be implemented for the following resources as part of the road relocation.

1. Air Quality: Watering would occur during construction to keep the dust down.
2. Cultural Resources: The road has been routed to avoid all known cultural resource sites. Additionally, if cultural or Native American resources are discovered during construction, operations would cease, and a BLM authorized officer would be notified immediately.
3. Floodplains: The road would be engineered to not impact any floodplains.
4. Invasive/Non-native species: Construction equipment would be pressure washed before coming to the project area and appropriate measures would be taken to reseed and rehabilitate areas of disturbance to decrease the establishment of cheatgrass.
5. Threatened, Endangered, or Candidate Wildlife Species: The project would occur outside of dates for wintering Bald Eagle use (November 15–March 15) if eagles are present.
6. Water Quality: BMPs such as sediment control structures including silt fences, erosion control mulching, etc. would be implemented to avoid impacts to water quality.
7. Livestock Grazing: Wherever the alignment crosses a maintained fence, a new cattle guard and gate would be constructed so that remaining portions of the allotments would still be useable.
8. Vegetation: Stipulations would be in place to require reseeding and rehabilitation of impacted areas after the completion of the project.

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9. Fish and Wildlife: Post-use reclamation would include reseeding of the road to provide for the re-establishment of wildlife habitat. Construction should occur outside of sage-grouse leking and nesting dates.
10. Soils: Measures would be taken to prevent soil loss and erosion to the extent possible. Reseeding with species suitable for the site to provide soil site stability would be required after project completion.
11. Visual Resources: Following landform contours would somewhat mitigate contrast.
12. Paleontology: Although surface inventory did not locate substantial resources on the surface, they could occur below the present land surface. Ground disturbing activities in bedrock of the Dakota and Tropic formations should be spot checked by a qualified paleontologist or their authorized agent for substantial resources, which if found, should be scientifically collected by a qualified paleontologist or their authorized agent and reposited at the Utah Museum of Natural History.
13. Lands and Access: The ROW would be temporary and the road would be removed and reclaimed upon termination of the mine.

In addition to the above listed mitigation measures, Alton Coal has prepared a Waste Disposal Plan, Safety Plan, and a Fire Prevention Plan which can be found in Appendix B, the Plan of Development.

Roadways would be maintained and kept open for public access throughout construction, as prescribed by the respective authorizing agencies. Alton Coal would be responsible for noxious weed control on project disturbed areas, temporary use ROW, and temporary use areas. Alton Coal would consult with the BLM Authorized Officer or field representative and local weed control agents for acceptable weed control management techniques within the limits imposed in the grant stipulations.

4.2.3 Residual Impacts:

Even after mitigation measures have been implemented, some impacts would still occur as a result of the Proposed Action. These impacts are discussed as part of the Chapter 4 analysis and BMPs would be implemented to make impacts as minimal as possible. Because the road relocation would be temporary, it is anticipated that the area would be reclaimed when private mining activities are complete.

4.2.4 Monitoring and/or Compliance:

Monitoring would occur during construction to ensure BMPs and mitigation measures proposed in this EA are followed.

4.2.5 Alternative B–No Action:

Under the No Action Alternative, current trends and conditions would continue in the area. The Proposed Action would be denied and the road would not be relocated on public land placing public safety at risk.

Under the No Action Alternative, there would be no impacts to the resources analyzed in Chapters 3 and 4 on federal lands because the Proposed Action would be denied and no impacts

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would occur as a function of road relocation. Although the road would likely be re-routed on private lands, an exact route has not been determined and therefore specific impacts cannot be analyzed. No impacts would result on federal lands to livestock grazing, vegetation, fish and wildlife, soils, recreation, visual resources, geology and minerals, and paleontology.

Impacts would result, however, to public health and safety because public traffic would interact with large mining equipment. Relocation of this road within the mining boundary under no action would be necessary therefore resulting in a crossing of public traffic with the mine equipment. Based on the size of the mine equipment, there is a limited observation range for the operators and interaction between the public and this equipment would result in unsafe conditions.

4.3 Cumulative Impacts Analysis:

"Cumulative impacts" are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions. The area that has been defined as the Cumulative Impacts Area of Analysis (CIAA) in this EA includes the western portion of Kane County.

4.3.1 Past and Present Actions:

Past or ongoing actions that affect the same components of the environment as the Proposed Action include proposed mining activities in and adjacent to the project area. Because the local area is dominated by desert and semi-desert habitats, agricultural use, rangeland use, and OHV use are common resulting in surface disturbance and vegetation removal.

In order to identify cumulative impacts as a result of the road relocation, it is assumed that recent and proposed surface-disturbing activities in the western portion of Kane County, would be most likely to result in a cumulative impact to the area. The following general types of projects were identified as having the greatest likelihood of generating potential cumulative impacts:

- Agriculture and grazing
- Recreation
- Local minerals and energy projects

4.3.2 Reasonably Foreseeable Action Scenario

The following reasonably foreseeable action scenario identifies reasonably foreseeable future actions that would cumulatively affect the same resources in the cumulative impact area as the Proposed Action and alternatives. The activities used have been identified in the Kanab RMP and would occur in the western portion of Kane County.

Continued surface-disturbing activities are foreseeable actions anticipated in western Kane County and have been identified in the Kanab RMP. These activities are driven by the BLM's multiple-use mandate and would occur unless another legislative action intercedes. The potential cumulative impacts of these land uses are then inherent and are not clearly identifiable because these uses are historically connected to the condition of the land.

Coal Mine Development of Private Coal Resources in the Alton Area

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Alton Coal has applied for a mining permit on private lands in the CIAA. The road relocation is a result of this proposed activity and therefore the mining is a reasonably foreseeable action adjacent to the project area.

Coal Mine Development of Federal Coal Resources in the Alton Area

A Lease By Application has been filed to mine federal coal near the Town of Alton, Utah. An EIS is currently underway to analyze the impacts of mining federal lands near the proposed project area.

Expansion of U.S. Highway 89

U.S. Highway 89 is anticipated to be widened over the next 20 years. The widening of the highway would allow for an increase in traffic volume. In addition, portions of the highway would be developed into a four-lane divided highway.

4.3.3 Cumulative Impacts

Cumulative Impacts resulting from the No Action Alternative would include an increased risk to public safety on portions of the existing Alton Road. If the road is not relocated, general public traffic and coal trucks would be traveling the same route increasing the potential for accidents. Cumulative impacts of the Proposed Action would include increased surface disturbance in the identified CIAA resulting in vegetation removal thereby impacting habitat, grazing, and recreation.

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CHAPTER 5: CONSULTATION AND COORDINATION

5.1 Introduction

The issue identification section of Chapter 1 identifies those issues analyzed in detail in Chapter 4. Appendix A provides the rationale for issues that were considered but not analyzed further. The issues were identified through the public involvement and agency involvement process described in Sections 5.2 and 5.3 below.

5.2 Persons, Groups, and Agencies Consulted

During the preparation of this EA, the public was notified of the Proposed Action and a 30-day comment period was posted on the BLM's Utah Environmental Notification Bulletin Board on May 22, 2008 with a public scoping period through June 22, 2008 (30 days). Those individuals on the Kanab Field Office mailing list were sent a copy of the Notice of Intent and a public comment form.

Table 5-1 lists those persons, agencies, and organizations that were consulted on various resources for preparation of this EA.

Table 5-1. All Persons, Agencies, and Organizations Consulted for Purposes of this EA

Name	Purpose and Authorities for Consultation or Coordination	Findings and Conclusions
U.S. Fish and Wildlife Service (USFWS)	Information on consultation, under Section 7 of the Endangered Species Act (16 USC 1531)	Because no impact would occur to listed species or migratory birds, no USFWS consultation was required.
Utah State Historic Preservation Office (SHPO)	Consultation for undertakings, as required by Section 106 of the National Historic Preservation Act (16 USC 470)	Because no cultural resource sites will be impacted, SHPO will be informed of this project in the Kanab Field Office quarterly report, as per the National Cultural Programmatic Agreement. No specific comments are anticipated from SHPO. This project is located in an area previously covered by cultural resource inventories, and no project-specific report will be prepared. Instead, the earlier reports will be referenced where necessary.

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Table 5-1. All Persons, Agencies, and Organizations Consulted for Purposes of this EA

Name	Purpose and Authorities for Consultation or Coordination	Findings and Conclusions
Kaibab Band of the Southern Paiute Tribe Hopi Navajo Zuni Ute	Consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1531) and the National Historic Preservation Act (16 USC 1531)	A letter informing the Tribes of this project was sent on 5 August, 2008. The Navajo responded with a letter on 18 September indicating that they had no concerns with this project. The Hopi responded in a letter of 25 August asking for clarification regarding this project, and following clarification responded in a letter of 27 October that they had no further concerns regarding this project. The Kaibab Paiute did not respond to this project in particular, but this project was discussed in a field visit to a different (nearby) project on 25 August. The Kaibab Paiute indicated at that time that they had no concerns with the road realignment project. The Ute and Zuni did not respond with any concerns regarding the Proposed Action.
Utah Division of Wildlife Resources (UDWR)	Consult with UDWR as the agency with expertise on impacts on game species.	Data and analysis regarding big game species incorporated into Chapters 3 and 4.

5.3 Summary of Public Participation

Two letters were received (Appendix C): one from Stephen Bloch of the Southern Utah Wilderness Alliance, and one from John Harja with the State of Utah.

5.3.1 Response to Public Comment

Due to the limited number of comments received, responses were not sent to commenters; instead the comments received in the letters have been responded to in Table 5-2 and through analysis in Chapter 4 of this EA.

Table 5-2. Response to Comments

Name of Commenter	Organization	Summary of Concerns	Response
Stephen Bloch	Southern Utah Wilderness Alliance	Relationship of road relocation to proposed federal coal development.	This would be a temporary relocation for the duration of a private mine not associated with the proposed federal mine for which a separate EIS is being prepared. The private mine is contingent on the mine being approved by the State of Utah, and the temporary road ROW would be reclaimed and the road would be

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Table 5-2. Response to Comments

Name of Commenter	Organization	Summary of Concerns	Response
			replaced in the original alignment and location when the mining is completed. Also see Section 4.3.2, Reasonably Foreseeable Action Scenario.
		Request a smaller ROW grant and a more direct route to U.S. Highway 89.	A direct route to U.S. Highway 89 is not applicable to the purpose and need for this project. Please see Section 2.4, Other Action Alternatives and Alternatives Considered but Eliminated from Further Analysis.
		Impacts to water bodies and alluvial valley floor from coal dust.	Please see Appendix A, in which it was determined no impacts would result to air quality. Fugitive dust would be mitigated through watering, thereby preventing deposition of particulates into water bodies.
		Describe where the 9,000 cubic yards of gravel would come from and analyze impacts if it would be obtained from federal lands.	Please see Section 4.2.1.8, Geology and Mineral Resources.
		Analyze impacts of chemical suppressants used for dust control on archeological and biological resources.	Due to the limited amount of dust, it is not anticipated that the levels of chemical suppressants would impact any other resources.
		Analyze paving the road.	Because the road is a temporary ROW, paving would not be a reasonable alternative.
		Conduct Class III cultural resources survey of the entire ROW.	Cultural resource surveys have been conducted. Please see Appendix A.
		Consult with Native American tribes on potential effects to archaeological sites.	Consultation has occurred. Please see Section 4.2.1.1, Native American Religious Concerns.
		Analyze dust impacts and plume visibility from Bryce Canyon National Park and U.S. Highway 89.	Impacts to air quality would be minimal. Watering should occur during construction to keep the dust down. No comments or concerns were expressed from Bryce Canyon National Park or the National Park Service.
		The BLM should independently analyze environmental information provided by SWCA.	The BLM is the ultimate decision maker and has provided to SWCA information used for analysis.

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Table 5-2. Response to Comments

Name of Commenter	Organization	Summary of Concerns	Response
			Please refer to Appendix A.
		Consider water quality, fish and wildlife, including but not limited to sage-grouse.	Impacts to sage-grouse and mule deer have been analyzed in Section 4.2.1.4, Fish and Wildlife. It was determined in Appendix A that impacts would not occur to other wildlife species.
		Discuss cumulative impacts of the Proposed Action.	Please see Section 4.3, Cumulative Impacts Analysis.
John Harja	State of Utah	If any "non-permitted" rock-crushing plants, asphalt plants, or concrete batch plants are located at the site, a permit would be required for operation of the equipment.	The road is a temporary ROW. No permanent facilities would be located at the site. Please see Appendix B, Plan of Development.
		Watering and/or chemical stabilizing methods providing vegetative or synthetic cover or windbreaks must be used to minimize dust.	Please see Section 2.2.2, Design Criteria. The top 3 inches of the road surface would be treated with calcium chloride to control dust.
		Provide protection for sage-grouse lek found near Alton, including off-site habitat improvements, or an attempt to develop a new lek, as well as avoiding construction during brood-rearing season from March 1 to June 1.	Impacts to sage-grouse can be found in Section 4.2.1.4, Fish and Wildlife. BMPs would be used to minimize impacts to sage-grouse.
		Analyze impacts to Paunsaugunt deer herd.	Please see Section 4.2.1.4, Fish and Wildlife.
		Coordinate with Utah Partners for Conservation Development (UPCD) to achieve off-site mitigation for impacts to sage-grouse and mule deer habitats.	The BLM is currently in contact with the Color Country sage-grouse Local Working Group for mitigation recommendations. The BLM is also part of the Southern Region UPCD, and would approach UPCD when specific mitigation projects arise and where funding would be needed.

5.4 List of Preparers

BLM staff specialists who determined the affected resources and contributed to the analysis in this EA are listed in Table 5-3. Other, non-BLM, specialists who contributed to this analysis are listed in Table 5-4.

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Table 5-3. BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Alan Titus	Paleontologist	Paleontology
Carson Gubler	Range Specialist	Air Quality Floodplains Invasive, Non-native Species Threatened, Endangered or Candidate Plant Species Water Quality (drinking/ground) Rangeland Health Standards and Guidelines Fuels/Fire Management
Doug Powell	Geologist	Wastes (hazardous or solid) Geology/Mineral Resources
Hugh Wolfe	Realty Specialist	Lands/Access - Project Lead
John Reese	Range Specialist	Farmlands (Prime or Unique) Livestock Grazing Woodland/Forestry Vegetation Soils
Keith Rigtrup	Planner	Environmental Justice Socioeconomics
Lisa Church	Wildlife Biologist	Threatened, Endangered or Candidate Wildlife Species Wetlands/Riparian Zones Fish and Wildlife
Matt Zweifel	Archeologist	Cultural Resources Native American Religious Concerns
Tom Christensen	Recreation Planner and Visual Resources	Areas of Critical Environmental Concern Wild and Scenic Rivers Wilderness Recreation Visual Resources Wilderness characteristics

Table 5-4. Non-BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Elisha Wardle	SWCA Project Manager	Project Oversight and Document Author
Ben Gaddis	SWCA Assistant Project Manager	Document Author and QA/QC
Steve Knox	SWCA Quality Control	Document Review and QA/QC
Megan Nelson	SWCA Environmental Technician	Document Author
Kari Chalker	SWCA Technical Editor	Technical Edit of Draft Document

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CHAPTER 6: REFERENCES

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INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

Project Title: Alton Road, Temporary Alignment

NEPA Log Number: UT-110-08-011

File/Serial Number:UTU-83017

Project Leader: Hugh Wolfe, Realty

Project Description: Relocation of the Existing County Road 136 to accommodate mining on private lands just south of Alton. This proposed right-of-way moves the existing road to a new location outside of the mine proposed on patented minerals and surface estate. This would be a temporary relocation for the length of the mine and is contingent on the mine being approved by the state of Utah. The road would be replaced in the same location when the mining is completed.

FOR EAs/CXs: NP: not present; NI: resource/use present but not impacted; PI: potentially impacted
FOR DNAs only: NC: no change (anticipated resource impacts not changed from those analyzed in the NEPA document on which the DNA is based)

STAFF REVIEW OF PROPOSAL:

NP/NI/PI NC	Resource	Date Reviewed	Signature	Review Comments (required for all NIs and PIs. PIs require further analysis.)
			CRITICAL ELEMENTS	
NI	Air Quality *(Carson)*	5/12/2008	/s./ C. Gubler	Impacts to air quality would be minimal, Watering should occur during construction to keep the dust down.
NP	Areas of Critical Environmental Concern *(Tom C.)*	5/8/08	/s/ T. Christensen	No ACECs within 20 miles of site
NI	Cultural Resources *(Matt Z.)*	8/4/08	/s/ M. Zweifel	Cultural resource inventories have been completed (see reports U-05-MQ-1568-b,p and U-07-BL-0969-b). The road has been designed to avoid all known cultural resource sites, and no sites will be impacted.
NP	Environmental Justice *(Keith)*	6/9/08	/s/ K. Rigtrup	No low income or minority populations in the project area.
NP	Farmlands (Prime or Unique) *(John)*	5/7/08	/s/ J. Reese	
NI	Floodplains *(Carson)*	5/12/2008	/s./ C. Gubler	Engineering of the road should be done so that Floodplains are no impacted.
NI	Invasive, Non-native Species *(Carson)*	5/12/2008	/s./ C. Gubler	Equipment should be pressure washed before coming to the project, and appropriate measures should be taken to reseed and rehab areas of disturbance to decrease the liklihood of cheat grass getting established.
PI	Native American Religious Concerns *(Matt Z.)*	8/4/08	/s/ M. Zweifel	Consultation regarding this road will be initiated, but because no sites will be impacted, no Tribal comments are anticipated.
NI	Threatened, Endangered or Candidate Plant Species *(Carson)*	5/15/2008	/s./ C. Gubler	No Threatened, Endangered or Candidate Plant Species are known to exist within the project area.
NI	Threatened, Endangered or Candidate Wildlife Species *(Lisa)*	5/28/08	/s/ L. Church	Limited use by Bald Eagles , proceed with project outside of dates for wintering use, Nov 15-March 15 if eagles are present.

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NI/PI NC	Resource	Date Reviewed	Signature	Review Comments (required for all NIs and PIs. PIs require further analysis.)
NI	Wastes (hazardous or solid) *(Doug P.)*	6/09/2008	/s/ Doug Powell	No anticipated impacts relating to solid or hazardous wastes.
NI	Water Quality (drinking/ground) *(Carson)*	5/15/2008	/s./ C. Gubler	No impacts to Water quality would be anticipated with this action. Mitigation would need to take place as part of standard operating procedures to ensure water quality is not impacted.
NI	Wetlands/Riparian Zones *(Lisa)*	5/28/0/8	/s/ L. Church	Limited riparian area goes under road limited on BLM would be addressed in cumulative effects.
NP	Wild and Scenic Rivers *(Tom C.)*	5/8/08	/s/ T. Christensen	No WSRs in Kane County
NP	Wilderness *(Tom C.)*	5/8/08	/s/ T. Christensen	No wilderness or WSAs within 15 miles of site
	OTHER RESOURCES / CONCERNS*			
NI	Rangeland Health Standards and Guidelines *(Carson)*	5/15/2008	/s./ C. Gubler	Some loss of Rangeland would occur as a result of this action however it is probably not enough so quantify it as an impact.
PI	Livestock Grazing *(John)*	5/7/08	/s/ J. Reese	The impact area will take in part of several grazing allotments, depending on mitigation measures the mine has in store for livestock grazing (if any) a new fence may need to be constructed so that remaining portions of the allotments will still be useable.
NI	Woodland / Forestry *(John)*	5/7/08	/s/ J. Reese	No significant impact to woodland/forestry is expected. Some removal of Pinyon and Juniper trees may take place, but doesn't pose a great impact.
PI	Vegetation *(John)*	5/7/08	/s/ J. Reese	Vegetation in the project will be impacted and stipulations should be in place to require re-seeding and rehabilitation of impacted area after the completion of the project.
PI	Fish and Wildlife *(Lisa)*	5/28/08	/s/ L. Church	Limited mule deer use, Sage grouse brooding in the area, and lek adjacent to area , relocation has the potential to impact use by grouse in winter and during nesting and brooding.
PI	Soils *(John)*	5/7/08	/s/ J. Reese	Measures should be taken to prevent soil loss and erosion to the extent possible. Re-seeding with species suitable for the site to provide soil site stability should be required after project completion.
PI	Recreation *(Tom C.)*	5/8/08	/s/ T. Christensen	Relocation would displace recreation along ROW route itself, and would move discordant sights and sounds closer to recreationists using the western portions of the project area.
PI	Visual Resources *(Tom C.)*	5/8/08	/s/ T. Christensen	Site lies within VRM class IV area, which allows major modification of the existing character of the landscape. Project would introduce new contrasts to form, line, texture and color. Following landform contours would somewhat mitigate contrast.
PI	Geology / Mineral Resources *(Doug P.)*	6/09/2008	/s/ Doug Powell	A gravel source will need to be identified and NEPA analysis performed if located on Federal lands.
PI	Paleontology *(Alan T.)*	5/02/2008	/s/ Alan Titus	Up to 70% of the proposed re-route is over Tropic and Dakota formation outcrops. These units have yielded highly significant fossils in the immediate area including vertebrate microfossil sites (Dakota), plesiosaurs, articulated fish remains, and exceptionally well-preserved specimens of rare invertebrate fossils. Inventory will be required.
NI	Lands / Access *(Hugh)*	05/02/2008	/s/Hugh Wolfe	As this is only a temporary right-of-way and the road will be removed and reclaimed at the termination of the mine there are no concerns anticipated to Lands or Access to public lands.
NI	Fuels / Fire Management *(Carson)*	5/15/2008	/s./ C. Gubler	No impact to Fuels and Fire management is expected, the added road would serve as a fire break and provide quicker access to

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P/NI/PI NC	Resource	Date Reviewed	Signature	Review Comments (required for all NIs and PIs. PIs require further analysis.)
				more areas for fire suppression.
NI	Socio-economics *(Keith)*	6/9/09	/s/ K. Rigtrup	Re-routing of the road would have no socio-economic impact, access would be maintained.
NP	Wilderness characteristics *(Tom C.)*	5/8/08	/s/ T. Christensen	No non-WSA lands with wilderness characteristics within 5 to 10 miles of site

FINAL REVIEW:

Reviewer Title	Date	Signature	Comments
NEPA Coordinator (Dennis)	12/18/2008	Dennis Pope	Completed final review of analysis
Manager ( )	12/18/08	[illegible]	Discussed with HW, on 12/18/08

NOTE: Review Comments should include information explaining how the specialist came to their conclusion - how does he/she know the element/resource is not present (site visit and date of visit, familiarity with location, etc.). For all 'NIs' give a brief explanation as to why that element/resource would not be impacted.

* The list of Other Resources / Concerns to be considered may vary by individual field office. Note: Native American Trust Responsibilities should be considered for FO's with Indian Mineral interests.

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APPENDIX 1-8

County Road K3993, Robinson Creek Road Agreement

Alton Coal Development, LLC and Kane County Agreement
(Kane County Road K3993 Restricted Access and Mine Escort)

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RESOLUTION 2009-17

AGREEMENT

AN AGREEMENT PROVIDING FOR A PUBLIC SAFETY ESCORT ALONG THE ROBINSON CREEK ROAD WITHIN THE COAL HOLLOW MINE

THIS AGREEMENT ("**Agreement**") is made and entered into this 7-13 day of 2009 ("**Effective Date**"), by and between Kane County, a body corporate and politic, having an address of 76 North Main Street, Kanab, Utah 84741 ("**County**"), and Alton Coal Development, LLC ("**Alton Coal**"), having an address of 463 North 100 West, Suite 1, Cedar City, Utah 84720 (collectively referred to herein as the "**Parties**").

RECITALS

WHEREAS, Alton Coal has applied with the Utah Division of Oil, Gas & Mining ("**Division**") for a permit to conduct coal mining operations at the Coal Hollow Mine under application number C/025/0005. The Mine will be developed on private lands located in Kane County, Utah, approximately 4 miles south of the Town of Alton within Sections 20, 29 and 30, Township 39 South, Range 5 West, SLB&M ("**Mine Permit Area**"); and

WHEREAS, a portion of Kane County Road K3993 ("**Robinson Creek Road**"), is located within the Mine Permit Area; and

WHEREAS, Robinson Creek Road is part of the county road system within the sole jurisdiction, maintenance and control of Kane County pursuant to Utah Code Ann. § 72-3-105; and

WHEREAS, the public's health, safety and welfare must be assured regarding public travel along the portion of Robinson Creek Road located within the Mine Permit Area; and

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WHEREAS, on March 25, 2009, the Division published a public notice regarding Robinson Creek Road in the *Southern Utah News* pursuant to Utah Administrative Code R645-103-234; and

WHEREAS, this Agreement confirms the responsibilities of Kane County and Alton Coal with respect to the conditions of restricted public access to the Robinson Creek Road.

AGREEMENT

NOW, THEREFORE, for and in consideration of the premises, the mutual covenants and agreements of the Parties hereto, the Parties hereto agree as follows:

I. PUBLIC ROAD CLASSIFICATION

Robinson Creek Road is a Class D public road and is part of the County road system within the sole jurisdiction, maintenance and control of Kane County pursuant to Utah Code Ann. § 72-3-105.

II. PUBLIC SAFETY ESCORT TO BE PROVIDED ALONG THE PORTION OF THE ROBINSON CREEK ROAD WITHIN THE COAL HOLLOW MINING BOUNDARY

A. In the interest of public health and safety, upon approval of Mine Permit C/025/0005, Alton Coal agrees to provide an escort for the public travelling the portion of the Robinson Creek Road located within the Mine Permit Area as follows:

1. Alton Coal is authorized by the County to place and maintain gates at each end of the Robinson Creek Road where the road enters the Coal Hollow Mine boundary. See Utah Code Ann. § 72-7-106. Alton Coal agrees to place and maintain the gates for the duration of this agreement.

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2. Alton Coal agrees to provide and maintain communication devises, i.e., a landline or a radio, at each gate for the purpose of providing public communication with mine personnel.

3. Alton Coal agrees to place and maintain signage at each gate advising public travelers along the Robinson Creek Road, where it enters the Coal Hollow Mine, to contact mine personnel through the provided communication devises for a safety escort through the Coal Hollow Mine.

4. Alton Coal agrees to provide safety orientation information at each gate related to public travel through the Coal Hollow Mine.

5. Alton Coal will provide a public safety escort along the Robinson Creek Road through the Coal Hollow Mine as expeditiously as possible. Except as provided in paragraph number nine (9) below, an escort will be provided within thirty (30) minutes of a request for a safety escort.

6. The County authorizes the gates to be secured to the extent necessary to facilitate a timely public safety escort. The gates shall not make travel along Robinson Creek Road restrictive beyond the stipulated response time to provide a safety escort. See Utah Code Ann. § 72-7-106, 5(b).

7. Alton Coal agrees to provide escort personnel twenty-four (24) hours a day, seven (7) days a week during the entire period mining operations affect the safety of public travel along the Robinson Creek Road, otherwise public travel along the Robinson Creek Road shall not be restricted.

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8. Alton Coal agrees to provide the public with additional contact information facilitating a pre-arranged escort further reducing travel delays.

9. Access along Robinson Creek Roads through the Coal Hollow Mine may occasionally be delayed beyond thirty (30) minutes, but only when necessary to ensure health and safety of the public when activities such as blasting or road construction immediately and directly affect safe travel along the road.

10. The County authorizes Alton Coal to make minor realignments and surface changes to the Robinson Creek Road as necessary to facilitate mine operations without the need for additional county permitting so long as the public's use of the road is not restricted by the realignment or surface changes.

11. At the end of the mining operation, Alton Coal will return the Robinson Creek Road to its original alignment and condition or to an alignment and condition acceptable to the County.

III. MISCELLANEOUS PROVISIONS

A. The Parties understand and agree that the Robinson Creek Road is a county road and that the public escort provisions set forth herein shall not be deemed to abandon or vacate the county road, user rights-of-way, or the R.S. 2477 right-of-way under Utah Code Ann. § 72-5-105.

B. The Parties agree that the public safety escort provisions set forth herein do not convey jurisdiction, authority or responsibility to Alton Coal regarding the construction, maintenance or operation of Robinson Creek Road beyond the terms of this Agreement. Said

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road will remain a Class D road within the county network under the sole authority of Kane County pursuant to Utah Code Ann. § 72-3-105.

C. This Agreement, together with its attached exhibits, constitutes the entire Agreement between the Parties and supersedes and replaces any and all prior negotiations, representations, warranties, understandings or contracts between the Parties. This Agreement may be modified by written, mutual agreement of the parties.

IN WITNESS WHEREOF, the Parties have executed this Agreement as of the Effective Date first above written.

ALTON COAL, LLC

BY: Chris Hulet

ITS Manager

RYAN ALLEN
Notary Public
State of Utah
Comm. No. 576616
My Comm. Expires May 12, 2013

KANE COUNTY

Commissioner Daniel W. Hulet

Commissioner Mark W. Habbeshaw

Commissioner Doug Heaton

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APPENDIX 1-9

Kane County Planning and Zoning Conditional Use Permits

Conditional Use Permits for Land Parcels 9-5-19-1, 9-5-20-2, 9-5-29-3, 9-5-30-2 and 9-5-30-1

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Conditional Use Permit Application

Fee $175.00

Property information and location

(All lines applicable to this site must be filled in)

Section 19,20,29,30 Township 39 South Range 5 West

Parcel # 9-5-19-1,9-5-20-2,9-5-29-3,9-5-30-2

You MUST include a parcel map obtained from the Kane County Recorder's Office with this application!

Property Owner(s) Information

Name(s): Sink Valley Ranch, LLC - C/O C. Burton Pugh

Address per tax rolls: 533 North 650 East

City/County: Lindon State: Utah Zip: 84042

Office/home phone: (801) 785-6220 Fax phone: ------

Mobile phone: ------ Message phone: ------

E-mail address: burtpugh@comcast.net

A copy of the deed, offer or tax notice MUST be included to demonstrate ownership

(for office use only)

CUP# 12 Fee: $175.00 Receipt #

Is this an amendment? ☐ Yes ☒ No

This application MUST be submitted no later than 14 days before the scheduled Planning Commission Meeting!

ATTACH A LOCATION MAP, SITE AND BUILDING PLAN, AND DETAILED DESCRIPTION OF PROPOSED USE

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Agent for the property owner(s) information

Name(s): Alton Coal Development, LLC

Address per tax rolls: 463 North 100 West, Suite 1

City/County: Cedar City **State:** Utah **Zip:** 84721

Office/home phone: (435) 867-5331 **Fax phone:** (435) 867-1192

Mobile phone: (435) 233-0528 **Message phone:** (435) 867-5331

E-mail address: cmccourt@altoncoal.com

Notarized affidavit by owner that agent has authority to act on their behalf

There shall be no presumption of approval of any aspect of the process. Each application for a Conditional Use Permit shall have all required submittals before it is accepted as a complete application.

APPLICATION IS HEREBY MADE TO THE PLANNING COMMISSION REQUESTING THAT:

a conditional use permit be issued to allow surface coal mining, and all support activities including coal sizing, stockpiling etc.. These operations will require construction of support buildings and structures as shown on the attached drawings 5-3,5-4 and 5-5. These activities are expected to occur for approximately 5 years. See attached mine plans for details related to required operations to effectively and safely extract coal from the specified parcels.

Total acreage of parcel: 733.68 (all) Area occupied by this use: ~400 acres

Current zoning designation: Agric. Current use of land: Grazing

I (We) understand that the Planning Commission shall not authorize a Conditional Use Permit unless the evidence presented is such as to establish that such use will not, under the circumstances of the particular case, be detrimental to the health, safety or general welfare of persons residing or working in the vicinity, and the proposed use will comply with the regulations and conditions specified in the Kane County Land Use Ordinance for such use.

Date signed: Chris Thurbert

Signature of owner(s) or agent(s):

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Planning and Zoning Commission Action

Date: May 13, 2009

☒ Approve

☐ Deny

Planning & Zoning Chairman _____

Requiring turn-lane improvements at street intersections when:
(i) an unsafe condition would be created by the development without the improvements; or
(ii) the projected increase in traffic generated by the new or expanded use will lower the level of service.

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Conditional Use Permit Application

Fee $175.00

Property information and location

(All lines applicable to this site must be filled in)

Section 30 Township 39 South Range 5 West

Parcel # 9-5-30-1

You MUST include a parcel map obtained from the Kane County Recorder's Office with this application!

Property Owner(s) Information

Name(s): Richard L. Dame

Address per tax rolls: 1620 Georgia Avenue

City/County: Boulder City State: NV Zip: 89005

Office/home phone: (702) 293-4773 Fax phone: ------

Mobile phone: (435)691-2911 Message phone: -----

E-mail address: RLDame@cox.net

A copy of the deed, offer or tax notice MUST be included to demonstrate ownership

(for office use only)

CUP# 12 Fee: $175.00 Receipt #

Is this an amendment? ☐ Yes ☒ No

This application MUST be submitted no later than 14 days before the scheduled Planning Commission Meeting!

ATTACH A LOCATION MAP, SITE AND BUILDING PLAN, AND DETAILED DESCRIPTION OF PROPOSED USE

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Agent for the property owner(s) information

Name(s): Alton Coal Development, LLC

Address per tax rolls: 463 North 100 West, Suite 1

City/County: Cedar City **State:** UT **Zip:** 84721

Office/home phone: (435) 867-5331 **Fax phone:** (435) 867-1192

Mobile phone: (435) 233-0528 **Message phone:** (435) 867-5331

E-mail address: cmccourt@altoncoal.com

Notarized affidavit by owner that agent has authority to act on their behalf

There shall be no presumption of approval of any aspect of the process. Each application for a Conditional Use Permit shall have all required submittals before it is accepted as a complete application.

APPLICATION IS HEREBY MADE TO THE PLANNING COMMISSION REQUESTING THAT:

a conditional use permit be issued to allow surface coal mining and reclamation activities. This parcel will not require any structures except for one sediment control pond. See attached mine plans for details related to the proposed operations.

Total acreage of parcel: 61.96 Area occupied by this use: 61.96 acres

Current zoning designation: Agric. Current use of land: Grazing

I (We) understand that the Planning Commission shall not authorize a Conditional Use Permit unless the evidence presented is such as to establish that such use will not, under the circumstances of the particular case, be detrimental to the health, safety or general welfare of persons residing or working in the vicinity, and the proposed use will comply with the regulations and conditions specified in the Kane County Land Use Ordinance for such use.

Date signed: Chris McCourt

Signature of owner(s) or agent(s):

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Planning and Zoning Commission Action

Date: May 13, 2009

☒ Approve

☐ Deny

Planning & Zoning Chairman

Requiring turn-lane improvements at street intersections when:

(i) an unsafe condition would be created by the development without the improvements; or

(ii) the projected increase in traffic generated by the new or expanded use will lower the level of service.

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CHAPTER 2

Soils

R645-301-200

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R645-301-200

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R645-301-200. SOILS

210. INTRODUCTION

211. Soil Removal

In this section, the Alton Coal Project will present a description of the pre-mining soil resources as specified under R645-301-221. Topsoil and subsoil to be saved under R645-301-232 will be separately removed and segregated from other materials.

212. Soil Redistribution

After removal, topsoil will be immediately redistributed in accordance with R645-301-242 and stockpiled pending redistribution under R645-301-234. For details refer to Section 5 of Appendix 2-1.

220. ENVIRONMENTAL DESCRIPTION

221. Prime Farmland Investigation

The Natural Resource Conservation Service conducted a prime farmland assessment in October 2006 and determined that "No Prime Farmland or Soils of Statewide Importance were found within the study area (Coal Hollow Mine area), per criteria outlined in the National Survey Handbook Part 622 and Exhibit UT603-1, respectively (C. Meier, 2006)." The assessment stated that the soils "..could classify as Soils of Statewide Importance, if irrigated.."

"An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI (C. Meier, 2006)."

"In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability (C. Meier, 2006)."

A copy of the NRCS Prime Farmland Determination is included in Section 1 of Appendix 2-1.

222. Soil Survey

An order 2 soils survey has been completed in 2007 at the Coal Hollow Project. Appendix 2-1 contains a report that provides the details for this survey. The survey area is on private lands leased by Alton Coal Development (ACD) and adjacent lands. This soil survey was prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3)

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develop a post mining reclamation plan using salvaged soil materials. This soil survey covers approximately 630 acres.

222.100. Soils Map

A map with soil map unit delineations is shown on Drawing 2-1.

222.200. Soil Identification

Soils in the Coal Hollow project soil survey area have been grouped into thirteen soil map units based on taxonomic classification, depth to parent material, and slope. The composition of these map units is described in table 2-1. Detailed descriptions of each soil map unit are included in Appendix 2-1. The soil survey map is Drawing 2-1.

Table 2-1. Soil map unit composition for the Coal Hollow project area.

Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
1		**A Family – Wapiti Family complex, 3 to 8 percent slopes**		
	65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
	10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
	5	Manzanst Family	fine, mixed, superactive, mesic Aridic Haplustalf	48
	5	N Family	fine, mixed, superactive, frigid Aquic Calciustoll	26
2		**M Family - Calendar Family – D Family complex, 3 to 8 percent slopes**		
	60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3
	25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4
	15	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	2
3		**Cibeque Family – Wapiti Familiy complex, 3 to 8 percent slopes**		
	60	Cibeque Family	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6
	30	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
4		**Jonale Family - Graystone Cobbly Substratum Family - Wapiti Family complex, 3 to 8 percent slopes**		
	50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17
	25	Graystone cobbly substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19
	5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	

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Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
5		**Calendar Family - M Family – Drififtv Family complex, 8 to 25 percent slopes**		
	40	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24
	30	M Family	fine, mixed, superactive, mesic Aridic Calciustept	25
	20	Drififtv Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49
	10	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
6		**Graystone - Cookcan – Jonale Family complex, 1 to 5 percent slopes**		
	45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15
	20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B
	20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16
	15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14
7		**Happyhollow Family - Alamosa complex, 1 to 5 percent slopes**		
	55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38
	20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A
	10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
	10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40
	3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
	2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
8		**Brumley – Graystone - Snilloc complex, 3 to 8 percent slopes**		
	40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22
	30	Graystone Cobbly Substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20
	20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21
	10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
9		**D Family - Deacon complex, 5 to 30 percent slopes**		
	55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41
	30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42
	10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5		Creek bottom	
10		**Zigzag clay, 8 to 25 percent slopes**		
	85	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	50
	10	Drififtv Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

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Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
11		**A family clay, 8 to 25 percent slopes**		
	85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28
	10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
	5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
12		**Manzanst Taxadjunct Family clay, 3 to 12 percent slopes**		
	85	Manzanst Family	very fine, mixed, superactive, mesic Aridic Haplustalf	48
	10	Manzanst Family Deep	very fine, mixed, superactive, mesic Aridic Haplustalf	60
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
13		**A Family – Happyhollow Family complex, 1 to 5 percent slopes**		
	80	A Family	fine, mixed, superactive, mesic Aridic Calciustept	59
	15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
	5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52

222.300 Soil Descriptions

Based on the order 2 soils survey that was completed on 2007, the following soil map unit descriptions and productivities apply. Additional information describing each soil map unit is contained in Appendix 2-1.

1 A Family – Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 1 is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997). The depth to Tropic shale is greater than 40 inches in the major soils (A and Wapiti soil families), but minor inclusions with Tropic shale from 20 to 40 inches deep occur. The map unit is dominated by big sagebrush and grasses.

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities and establish topsoil and subsoil stockpiles.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1*
20	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
10	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	33
5	M	fine, mixed, superactive, mesic Aridic Haplustepts	26

* Lab analysis of typifying soil pedon for map unit.

Map unit 1 description is continued on page 2-5.

Typifying Soil Pedon Descriptions

Soil colors are for dry soil unless specified otherwise.

The typifying soil pedon for A family soils in map unit 1 is soil pedon 1. The surface is a grayish brown clay loam 12 inches thick, dark grayish brown (moist). The subsoil (calcic) consists of light brownish gray silty clay, light olive brown (moist). Decomposing Tropic shale occurs at 42 inches below the surface.

The typifying soil pedon for the Wapiti family soils in map unit 1 is soil pedon 32. The mollic surface is a brown loam 8 inches thick, very dark grayish brown (moist). The subsurface (argillic) is a pale brown clay loam and silty clay, brown (moist). The subsoil (calcic) is pink loam to 6 feet, brown (moist). The underlying soil to nearly 12 feet is light yellowish brown silty clay over pink coarse sands with 10 percent faint strong brown mottles.

Supporting Soil Pedons

Soil family A is also represented by soil pits 27 and 30 in map unit A. Soil pit 27 does not have Tropic shale within 140 inches of the surface. Soil pit 30 has decomposing Tropic shale at 105 inches below the surface.

Laboratory Analysis

Analysis of soil samples from soil pit 1 had a poor soil pH (8.7) from 24 to 42 inches and fair lime percents (22.6 to 28.3 percent) throughout the soil profile. The silty clay texture at 24 inches is in the poor category for texture. SAR increases gradually with depth to 4.02 in the 24 to 42 inch horizon and then reaches 12.3 in the tropic shale below 42 inches.

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Soil Inclusions

Small inclusions of D Family and N Family soils occur within map unit 1. D Family soils are similar to the A Family soils, but have a mollic epipedon (dark surface). The N family soils are very deep, similar to the D Family soil, but have aquic soil conditions below 20 inches and are located in concave depressions within map unit 1.

2 M Family – Calendar Family - D Family complex, 3 to 8 percent slopes

General Description

This map unit is dominated by soils with Tropic shale parent material at 20 to 72 inches below the surface. The map unit is dominated by big sagebrush and grasses with some pinyon pine and Utah juniper encroaching along edges of the map unit near map unit 5. This map unit is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997).

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities. A second small delineation of map unit 2 occurs along the south boundary of the proposed year 1 mining area west of the county road.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3*
25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4*
15	D family	fine, mixed, superactive, mesic Aridic Calciustoll	2*

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for M family soils in map unit 2 is soil pedon 3. The surface is a brown loam 4 inches thick, dark brown (moist). The subsurface (cambic) is a grayish brown clay loam and silty clay loam 15 inches thick, brown (moist). The underlying subsoil to 33 inches is light brownish gray silty clay, light olive brown (moist). Tropic shale parent material occurs at 33 inches below the surface.

The typifying soil pedon for Calendar family soils in map unit 2 is pedon 4. The surface is pale brown silty clay 4 inches thick, dark grayish brown (moist). The subsurface (cambic) is light brownish gray silty clay moderate to strong structure, dark grayish brown (moist) to 31 inches. Tropic shale parent material occurs at 31 inches.

The typifying soil pedon for D family soils in map unit 2 is pedon 2. The surface (mollic) is brown clay loam 12 inches thick, very dark grayish brown (moist). The subsurface (cambic and calcic) is pale brown silty clay and clay to 48 inches deep, brown (moist).

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The subsoil is white silty clay to 72 inches, brown (moist). Tropic shale parent material occurs at 72 inches below the surface.

Supporting Soil Pedons

Soil pedon 12 is representative of soil type M and is located in the delineation of map unit 2 along the south boundary of the year 1 mining area. The depth to Tropic shale in pedon 12 is 26 inches.

Laboratory Analysis

The main limiting feature of soils in map unit 2 is an increase of conductivity and SAR into the fair range as the soil depth reaches the interface with Tropic shale. The percent lime in the soil ranges from 18.6 to 27.5 above the Tropic shale. The saturation percentage increases with the percent clay, but remains in the fair range even with the clay and silty clay.

3 Cibeque Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 3 is characterized by very deep soils that show some indication of alluvial deposition most likely from the large alluvial fan that formed this portion of Sink Valley. Recent soil deposition from nearby Robinson Creek is indicated in pedon 6 by an increase of organic matter at 12 inches below the soil surface.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	Cibeque	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6*
30	Wapiti	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Cibeque family soils in map unit 3 is soil pedon 6. The surface is brown loamy sand 12 inches thick, dark yellowish brown (moist). The subsoil (calcic) is pale brown loam and sandy loam to 34 inches deep, brown (moist). The underlying soil to 60 inches is light grayish brown silty clay, brown (moist).

The typifying soil pedon for Wapiti family in map unit 3 is soil pedon 31. The surface (mollic) is dark grayish brown loam 7 inches thick, dark brown (moist). The subsurface (argillic) is light yellowish brown clay loam to 17 inches, dark yellowish brown (moist).

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The subsoil (lower argillic and calcic) is light brownish gray and brown clay loam and loam to 52 inches, grayish brown and brown (moist). The underlying soil to 110 inches is very pale brown sandy loam and loamy sand, brown and yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 13 is representative of Cibeque family in map unit 3.

Laboratory Analysis

Soil pH increases to the fair category (8.3 to 8.5) at 6 inches below the surface in pedon 6. The soil pH is consistent with percent lime in fair category (18.4 to 29.2). The loamy sand surface has a fair water holding capacity. Organic matter has an irregular increase at 12 inches from 0.7 in the A2 horizon to 2.6 in the upper Bk horizon.

Soil Inclusions

Small inclusions of A and Calendar soil families occur in map unit 3. A family soils are similar to Cibeque soils, but have a higher percentage of clay in the control section (10 to 40 inches). Calendar soils are very deep but do not have either an argillic horizon (increase in illuvial clays) or a calcic horizon within 40 inches of the soil surface.

4 Jonale Family – Graystone cobbly substratum Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 4 is characterized by very deep fine-loamy and coarse-loamy soils with mollic epipedons and calcic horizons. Lime accumulations below 12 to 22 inches are common in these soils. Soil pH is strongly alkaline below 22 inches in some soils. Vegetation in this map unit is big sagebrush and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17*
25	Graystone cobbly substratum family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39*
15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19*
5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	7*
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	

* Lab analysis of typifying soil pedon for map unit.

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Typifying Soil Pedon Descriptions

The typifying soil pedon for Jonale family in map unit 4 is soil pedon 17. The surface (mollic) is a brown clay loam 9 inches thick, dark brown (moist). The subsurface (cambic) is a pale brown clay loam to 18 inches, brown (moist). The lower subsurface (Bwk) to 45 inches is light yellowish brown loam and clay loam, dark yellowish brown (moist). The underlying subsoil (calcic) is very pale brown clay loam and silty clay to 80 inches, yellowish brown (moist).

The typifying soil pedon for Graystone cobbly substratum family in map unit 4 is soil pedon 39. The surface is brown clay loam 12 inches thick, dark brown (moist). The subsurface (calcic) is a very pale brown to light yellowish brown sandy loam to 36 inches deep, yellowish brown (moist) with 0 to 15 percent gravels and cobbles. The underlying subsoil is very pale brown very cobbly loamy sand to 75 inches, brown (moist).

The typifying soil pedon for Wapiti family in map unit 4 is soil pedon 19. The surface (mollic) is a grayish brown loam 6 inches thick, very dark grayish brown (moist). The subsurface (upper argillic) is a brown and pale brown clay loam to 24 inches deep, dark grayish brown and yellowish brown (moist). The lower subsurface (lower argillic and upper calcic, Btk) is a pale brown loam to 37 inches deep, brown (moist). The underlying subsoil (calcic) is a pale brown and light yellowish brown sandy loam to 90 inches deep, yellowish brown (moist).

Supporting Soil Pedons

Jonale family is represented by soil pedons 5, 8, 10, 18B, 23, 34, and 35. Soil family H is represented by soil pedons 11, 36, and 37.

Laboratory Analysis

Jonale soil family is characterized by soil pH in the poor range of 8.6 to 9.0 (Utah DOGM, 2005) at depths below 22 to 40 inches. This strongly alkaline soil pH corresponds to lime percentages of greater than 30 in this same portion of the soil profile.

Graystone cobbly substratum soil family is dominated by sandy loam and loamy sand textures with some clay loam. Lime accumulation occurs below 12 to 16 inches, but percentages are lower relative to the fine-loamy type C soils. Soil pH becomes strongly alkaline at depths of 48 inches in some pedons. There is 15 to 45 percent gravels and cobbles below 36 inches.

Wapiti soil family has fair levels of carbonates throughout the soil profile. Soil pH was measured as poor below 68" in soil pedon 19.

Soil Inclusions

Soil family D is represented by pedon 7 in map unit 4. There are also small inclusions of

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soil family A where map unit 4 borders map units 1 and 11.

5 Calendar Family - M Family – Drifity Family complex, 8 to 25 percent slopes

General Description

These soils are moderately deep (20 to 40 inches) to shallow (less than 20 inches to Tropic shale. The moderately deep soils have clayey textures, while the shallow soils are loamy. Vegetation is pinyon pine, Utah juniper, black sage and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24*
30	M family	fine, mixed, superactive, mesic Aridic Calciustept	25*
20	Drifity Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49*
5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Calendar family in map unit 5 is soil pedon 24. The surface is olive brown clay 5 inches thick, dark grayish brown (moist). The subsurface (cambic) is dark grayish brown and olive clay with moderate to strong blocky structure to 32 inches. Tropic shale parent material is at 32 inches.

The typifying soil pedon for M family in map unit 5 is soil pedon 25. The surface is covered with a half inch of decomposing needles and twigs. The soil surface is light brown clay 5 inches thick, brown (moist). The subsurface (calcic) is brown and strong brown clay with lime accumulations, dark brown (moist). Tropic shale parent material is at 32 inches.

The typifying soil pedon for Drifity family in map unit 5 is soil pedon 49. The surface light yellowish brown silty clay loam 3 inches thick, light olive brown (moist). The subsoil is a light olive brown loam to 10 inches, olive brown (moist). Interbeded sandstone and Tropic shale are at 10 inches.

Laboratory Analysis

Calendar soil family is characterized by percent clay of 44 to 47 with correspondingly high saturation percentages of 73.6 to 91.2. Conductivity increases to 7.8 at 17 inches below the surface.

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Soil type M is characterized by percent clay of 40 to 47 with correspondingly high saturation percentages of 58.5 to 80.6 in the upper 20 inches of the soil profile. The percent clay decreases to 33 percent below 20 inches. Lime percentage is greater than 30 in the 5 to 20 inch depth, but less than 5 above and below this zone.

Drifity soil family is characterized by pH of 8.1 to 8.4, lime percentage of 18, and SAR of less than 0.1.

Soil Inclusions

There are some inclusions of Zigzag soils that are shallow (less than 20 inches) to Tropic shale. Zigzag soils are clayey.

6 Graystone – Cookcan – Jonale Family complex, 1 to 5 percent slopes

General Description

These medium to coarse textured soils are very deep. Wet soil conditions are present at varying depths in all of the map unit soils. The depth to wet soil conditions varies from 14 to 58 inches. This map unit is not a good source of subsoil. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is grasses, sedges, and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15*
20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B*
20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16*
15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14*

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Graystone soils in map unit 6 is soil pedon 15. There is a dense root mat 1 inch thick on the surface. The surface is brown sandy loam 8 inches thick, dark brown (moist). The subsurface (cambic) is pale brown loam with moderate structure, dark yellowish brown (moist) to 20 inches. The subsoil (calcic) is very pale brown loam to 58 inches deep, yellowish brown (moist). The underlying soil is yellow and brownish yellow sandy loam with common prominent mottles to 96 inches, yellowish brown (moist).

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The typifying soil pedon for Cookcan soils in map unit 6 is soil pedon 9B. The surface is dark grayish brown loam 6 inches thick, very dark grayish brown (moist). The lower surface is grayish brown sandy clay loam to 14 inches with few faint mottles, dark grayish brown (moist). The subsurface is light brownish gray sandy loam with common prominent mottles, dark gray (moist). The subsoil is light gray sandy loam with many prominent mottles, grayish brown (moist). The soil was wet below 48 inches.

The typifying soil pedon for Jonale soil family in map unit 6 is soil pedon 16. There is a dense root mat 1 ½ inch thick on the surface. The surface is dark grayish brown silty clay loam 8 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 18 inches, strong brown (moist). The subsoil is pink clay loam to 36 inches, brown (moist). The lower subsoil is pink silty clay loam and loam with few faint strong brown mottles to 68 inches, brown (moist). The underlying soil is light brownish gray clay loam with common prominent yellowish red mottles, grayish brown (moist).

Supporting Soil Pedons

Soil pedon 9A is similar to Graystone soils, but it has carbonates throughout the soil profile without any zone of accumulation.

Laboratory Analysis

Strongly alkaline soil pH (8.6 to 9.0) within 12 to 20 inches of the soil surface is the main limiting feature of the soils in map unit 6. Soil pedon 9A has very strongly alkaline pH (greater than 9.0) below 12 inches of the surface.

Lime percentage exceeds 30 in 3 of 5 pedons within 12 to 20 inches of the surface. Lime percentage ranges from 15 to 26 in the other two pedons from the surface to 48 inches.

Soil Inclusions

Soil pedon 14 is representative of I family soils within map unit 6 that do not have a mollic epipedon (dark surface) and have aquic (wet) soil conditions within 30 inches of the surface. These soils have a calcic horizon.

7 Happyhollow Family – Alamosa complex, 1 to 5 percent slopes

General Description

This soil map unit is located on a Tropic shale structural bench on the east side of the Sink Valley fault.Soils are characterized by clay and a high water table that is perched on top of the heavy clay soils. The high water table is at or within a foot of the soil surface during the wet period of the year. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is sedges and forbs.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38*
20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A*
10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40*
3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Happyhollow family soils in map unit 7 is soil pedon 38. The surface is dark grayish brown (moist) silty clay 6 inches thick. The subsurface is a yellowish brown (moist) silty clay 6 inches thick. The calcic horizon begins at 12 inches below the surface and is a light yellowish brown (moist) to very pale brown (moist) silty clay. The calcic horizon continues to 48 inches or deeper. The water table was at 29 inches when the pit was described in March 2007. Mottles and gleyed soil were observed below 12 inches. Vegetation is grasses, sedges, widely scattered Wyoming big sagebrush, and wild rose.

The typifying soil pedon for Alamosa soils in map unit 7 is soil pedon 18A. The mollic surface is a very dark grayish brown (moist) loam to 7 inches. The cambic horizon is a brown (moist) loam to 15 inches deep. The calcic horizon is a light olive brown (moist) sandy loam to 30 inches. The underlying soil is grayish brown (moist) clay loam and sandy clay loam to 60 inches deep. Mottles were observed below 7 inches. The water table was at 51 inches when the described in September 2006.

Supporting Soil Pedons

Happyhollow family soil type was observed in pedon 45 within map unit 7 and a similar clayey soil in pedon 44. The Alamoss soil was also observed in pit 46.

Laboratory Analysis

The Happyhollow family soil is characterized by silty clay from the surface down to 24 inches or greater. Soil pH is 8.3 to 8.5 in the 12 to 24" horizon. Saturation percentage ranges from 69.9 to 81.8 in the upper 24 inches. The calcium carbonate equivalent ranges from 17.8 to 28.3 in the upper 20 inches and then increases to 44.5 below 20 inches. This soil pit was not sampled below 24 inches, because of the high water table.

Alamosa soil is characterized by medium textured soils (loam, clay loam, and sandy clay loam) in the upper 60 inches. The calcium carbonate equivalent ranges increases from 20.2 percent in the upper 7 inches to 29.3 percent in the 30 to 45 inch horizon.

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Soil Inclusions

A soil similar to Alamosa soils, but with more clay in the control section is in localized areas. Soil mottles were observed and water was flowing into pit 43 when it was described in April 2007. The water table appeared to be perched on top of the underlying clay horizon at 54 inches.

Tetonview family soils were identified in soil pit 40. Mottles were observed below 6 inches and a water table at 23 inches when the pit was described in March 2007. This soil has a dark surface (mollic) and a calcic horizon.

Dry soil profiles occur on small isolated mounds within map unit 7. These non-hydric soils include Brumley and Jonale family soils. Both are very deep soils with a calcic horizon. Jonale family soils have a dark surface (mollic).

8 Brumley – Graystone Cobbly - Snilloc complex, 3 to 8 percent slopes

General Description

These soils developed in very deep alluvium on the east side of the Coal Hollow project area. They are medium to coarse textured. Evidence of a fluctuating water table was observed in most soils below 48 to 60 inches, depending on location and physiographic setting. This map unit would be a good source of cover material, but most of the planned disturbance in this area will be limited to cover soil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22*
30	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20*
20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21*
10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

Colors are for dry soil unless other wise noted.

The typifying soil pedon for the Brumley soils in map unit 8 is soil pedon 22. The surface is pale brown sandy loam to 6 inches. The argillic and upper calcic horizon is a light yellowish brown silty clay loam and sandy clay loam to 28 inches. The underlying soil is very pale brown sandy loam to 84 inches. Mottles increase significantly below 48 inches indicating that there is fluctuating water table during wet years. This soil supports Gamble oak, snowberry, grasses, and forbs.

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The typifying soil pedon for the Graystone soil in map unit 8 is soil pedon 20. The surface is brown loam to 6 inches. The cambic horizon is light yellowish brown clay loam to 13 inches. The calcic horizon is very pale brown to light yellowish brown sandy loam and loamy sand to 54 inches. The underlying soil is a light yellowish brown loam to 72 inches and loamy sand to 96 inches. This soil supports Pinyon pine, Utah Juniper, Gamble oak, and snowberry.

The typifying soil pedon for Snilloc soils in map unit 8 is soil pedon 21. The surface is a light yellowish brown sandy clay loam to 8 inches. The calcic horizon is a pale brown sandy clay loam to 18 inches. The underlying soil is a pale brown strongly alkaline sandy loam to 96 inches. This soil was described in an opening of Wyoming big sagebrush within a larger area of Gamble oak.

Supporting Soil Pedons

A moist phase of the Brumley soil was observed in pit 47 in big sagebrush in map unit 8. A few faint mottles were observed below 24 inches. The amount of soil mottling increased significantly below 44 inches. This soil is on a low mound surrounded on three sides by wet soils in map unit 7. A water table was not observed when the pit was described in April 2007, but the mottles indicate that it is common for the water to rise within 44 inches of the surface in most years, and 24 inches in wet year.

Laboratory Analysis

The Brumley soil has calcium carbonate equivalents ranging from 17.5 to 23.8 percent.

The Graystone soil has a low saturation percentage in the 13 to 28 inch horizon (calcic). Calcium carbonate equivalents range from 16.5 to 25.4 percent. Available water capacity is 0.08 in layers of loamy sands below 28 inches.

The Snilloc family soil is characterized by strongly alkaline soil pH (8.7) below 36 inches. Calcium carbonate equivalents range from 16.8 to 29.8 percent.

Soil Inclusions

The Jonale family soils occur within this map unit. These soils are similar to Brumley soils, but have a dark surface (mollic).

9 D Family - Deacon complex, 5 to 30 percent slopes

General Description

These clayey soils are very deep and dominated by clayey textures. They have a dark surface (mollic epipedon). The D family soil has an increase in lime at 6 to 12 inches below the surface, while the Deacon soil has similar levels of lime throughout the soil profile. Soils in this map unit appear to have developed from the large alluvial fan that

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covers most of Sink Valley. The map unit is delineated along Robinson Creek and in an area south of the creek that could be the remnants of a historic channel. Vegetation is dominantly big sagebrush, rabbitbrush, and grasses with pinyon pine and Utah juniper encroaching from adjacent areas.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41*
30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42*
10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5		Creek bottom	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for the D family soil in map unit 9 is soil pedon 41. The surface is brown sandy clay loam to 6 inches, dark brown (moist). The lower surface is brown clay to 12 inches, dark brown (moist). The subsurface (cambic) is pale brown silty clay to 36 inches, brown (moist). The subsoil (calcic) is very pale brown silty clay loam and sandy loam to 80 inches, yellowish brown (moist).

The typifying soil pedon for Deacon soils in map unit 9 is soil pedon 42. The surface is brown loam 9 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 24 inches, brown (moist). The upper subsoil (lower cambic) is pale brown sandy clay loam to 36 inches, brown (moist). The lower subsoil is light yellowish brown loam to 48 inches, yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 29 is representative of the D family soil in map unit 9.

Laboratory Analysis

Poor soil pH at depth and clayey horizons characterize soils in map unit 9. Soil pH is poor below 64 inches in the D family soil (pit 41) and below 36 inches in the Deacon soil. Horizons of silty clay and clay occur in the D family soil (pit 41) between 6 and 36 inches. The clayey horizon in the Deacon soil is between 9 and 24 inches.

Soil Inclusions

The channel area of Robinson Creek comprises a small portion of this map unit. The creek bottom is not vegetated.

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10 Zigzag clay, 8 to 25 percent slopes

General Description

These clayey soils are shallow to Tropic shale and formed along the Sink Valley escarpment. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Zigzag	clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	50*
10	Drififty Family	loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthent	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the Zigzag soil in map unit 10 is soil pedon 50. The surface is light brownish gray clay to 4 inches, dark grayish brown (moist). The subsurface is light brownish gray clay to 19 inches, dark grayish brown and olive brown (moist). Tropic shale is at 19 inches.

Laboratory Analysis

Clayey soil texture is the main limiting feature to the Zigzag soil in map unit 10. Lime percentage is between 18 and 19 throughout the soil profile. SAR is less than 1. Soil pH is in the good to fair range (8.1 to 8.4).

Soil Inclusions

The Drififty family soil occurs along ridges where the Tropic shale is interbeded with sandstone. These soils are loamy and less than 20 inches deep.
Calendar family soil occur in concave toeslope areas. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

11 A Family clay, 8 to 25 percent slopes

General Description

These soils are very deep and are on the footslope and backslope of the Sink Valley fault escarpment. Vegetation is grasses, rabbitbrush, and big sagebrush.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28*
10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
5	Zigzag	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the A family soil in map unit 11 is soil pedon 28. The surface is grayish brown clay to 8 inches, dark grayish brown (moist). The subsurface (cambic) is gray clay with moderate blocky structure to 24 inches, grayish brown (moist). The upper subsoil (calcic, Bwk) is gray clay with common fine soft calcium carbonate masses to 48 inches, grayish brown (moist). The lower subsoil (calcic, Bk) is light grayish brown clay with common fine and medium soft calcium carbonate masses to 102 inches, grayish brown (moist).

Laboratory Analysis

Clay texture is the primary limiting feature with the A family soil in map unit 11. SAR and conductivity increase significantly in the 24 to 48 inch horizon, but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

Inclusions of the Calendar family soil occur along shoulders of hills and ridges. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

Small inclusions of the Zigzag soil occur on the summits of ridges and hills. These soils are clayey and shallow (less than 20 inches) to Tropic shale.

12 Manzanst Taxadjunct Family clay, 3 to 12 percent slopes

General Description

These clayey soils are deep to very deep to Tropic shale and formed on gently sloping to moderately steep slopes along the west side of Sink Valley. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Manzanst taxadjunct, very deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	48*
10	Manzanst taxadjunct, deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	60
5	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the Manzanst taxadjunct soil in map unit 10 is soil pedon 48. The surface is grayish brown clay (moist) 3 inches, very dark grayish brown (moist). The subsurface is light brownish gray clay to 30 inches, dark grayish brown (moist). The substratum is light brownish gray clay with 3 to 10 percent very fine and fine calcium carbonate masses to 84 inches, dark grayish brown (moist).

The typifying pedon for the Manzanst taxadjunct deep phase is pedon 60. It is similar to pedon 48. Tropic shale is at 48 inches.

Laboratory Analysis

Clayey soil texture and SAR are the main limiting features of the Manzanst soil family in map unit 12. The SAR ranges from 10.80 to 12.70 below 12 inches.

Soil Inclusions

The A family soil occurs on the toeslopes and in swales where alluvium has accumulated. These soils are clayey and very deep (greater than 60 inches). They have an accumulation of carbonates in the subsoil.

13 A Family – Happyhollow Family complex, 1 to 5 percent slopes

General Description

These clayey soils are very deep to Tropic shale and formed on nearly level to gently sloping slopes in the south central portion of Sink Valley. Vegetation is grasses. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
80	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	59
15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for the A family soil in map unit 13 is soil pedon 59. The surface is light yellowish brown clay loam to 10 inches, dark grayish brown (moist). The subsurface is light yellowish brown and very pale brown clay loam to 45 inches, yellowish brown and pale brown (moist). The substratum is very pale brown and pale yellow sandy clay loam to 76 inches. Reddish yellow medium and coarse mottles were observed below 62 inches.

The typifying soil pedon for the Happyhollow family soil is soil pedon 45. The surface is light brownish gray loam to 12 inches, dark grayish brown (moist). The subsurface is light gray and very pale brown sandy clay loam to 48 inches, gray and light yellowish brown (moist). The substratum is very pale brown sandy clay loam to 84 inches, light yellowish brown (moist). The lower substratum is light gray silty clay to 100 inches, gray (moist). Yellow and brownish yellow medium and coarse mottles were observed below 5 inches.

Laboratory Analysis

Field conductivity (ECe) measurements for soil pit 59 ranged from 0.39 to 1.30 mmhos/cm.

Lab analysis of soil pit 28 is representative of the A family soil in map unit 13. Clay texture is the primary limiting feature with the A family soil in map unit 13. SAR and conductivity increase significantly in the 24 to 48 inch horizon (pedon 28), but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

The I family soils are similar to the A family soil, but they have aquic conditions below 20 inches. Reddish yellow fine mottles were observed in soil pedon 52 below 24 inches.

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222.400 Present and Potential Productivity of Existing Soils

Soils in the Coal Hollow project area support big sagebrush, grasses (native and introduced species), pinyon pine, Utah juniper, and Gambel oak. Detailed descriptions of the present and potential productivity of the soils are detailed in Chapter 3, Section 321.200.

223. Soil Characterization

This soil survey was made in accordance with the guidelines for an order 2 soil survey as detailed in the Soil Survey manual (USDA 1993). Soils were classified using the Keys to Soil Taxonomy, Ninth Edition (USDA 2003). Respresentative soil samples were submitted for laboratory analysis of the parameters outlined by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (2005).

224. Substitute Topsoil

Based on the 2006-2007 order 2 soil survey, sufficient quantities of suitable topsoil and subsoil are available for reclamation within the project area. The Coal Hollow Project does not plan to use substitute material for topsoil at the time of reclamation. However, if in the future the Coal Hollow mine plan proposes to use selected overburden materials as a supplement or substitute for topsoil, an application will be provided to the DOGM that includes results of analyses, trials, and tests as described under R645-301-232.100 through R645-301-232.600, R645-301-234, R645-301-242, and R645-301-243. DOGM may also require the results of field-site trials or greenhouse tests as required under R645-301-233.

230. Operation Plan

231. General Requirements

231.100. Methods for Removing and Storing Subsoil and Topsoil

The methods for removing and storing topsoil, subsoil, and other materials will be to first remove the woody plants from the area and place them in piles for later placement in pit backfills. Next, dozers or scrapers will remove the topsoil layer to a depth determined by the soil survey. The topsoil will be stockpiled and protected from wind and water erosion. Stockpiles that will be in place for less than 1 year will be coated with a tackifier at the manufacturer's suggested rate for dust control applications. Those stockpiles that will be in place for at least one year will be seeded and covered with mulch during the appropriate season. Side slopes of stockpiles will be sloped to 3h:1v: The suitable subsoil will then be removed and stockpiled separately from the topsoil. The depth of topsoil and subsoil salvage will be determined by the aforementioned soil survey and in the field during mining by the Coal Hollow environmental technician in consultation with a certified professional soil scientist. Stockpiling of topsoil and subsoil will only occur when direct placement (or live hauling) is not operationally practical. Drawing 2-2 shows planned topsoil stockpiles and topsoil removal plans.

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231.200. Suitable Substitute Topsoil

The use of substitute topsoil is not planned based on the 2007 soil survey information. Demonstration studies of the suitability of topsoil substitutes or supplements will be submitted to the DOGM if the use of topsoil substitutes become necessary for future reclamation and revegetation.

231.300. Soil Testing for Reclamation

The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil in the same order it existed prior to removal by the mining activities. Next, a basic topsoil (top 8 inches of reclamation profile) sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

Available phosphorus (P)
Soluble Potassium (K)
Nitrate-Nitrogen

One composite sample will be collected from approximately every 2 to 5 acres based on soil types and variability. Each composite will be comprised of at least 4 su-samples.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1 (native topsoil and subsoil) and Table C-2 (samples from core hole/overburden pits) of Appendix 2-1.

231.400. Topsoil Handling

The topsoil will be removed from the mine area and either live hauled to a reclamation area or stored separately. All soil stockpiles piles will be seeded with an appropriate interim seed mix to prevent loss and deterioration by wind and water erosion. Soil stockpiles will have side slopes graded to a maximum 3h:1v. Piles will be bermed or otherwise treated to prevent the transport of sediments away from the pile. Details about soil horizons and zones planned for use as subsoil are detailed in Appendix 2-1. A detailed map showing stockpile designs/locations and soil removal are shown on Drawing 2-2.

232. Topsoil and Subsoil Removal

232.100. Separate Layers
All soil materials will be removed in separate layers from the area to be disturbed, and segregated.

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Based on soil map units, average depths have been estimated and will be used as a guide and monitored in the field. Refer to Table 4-2 in Appendix 2-1. Soil will be salvaged and directly placed or stockpiled as either topsoil or subsoil.

232.200. Topsoil of Insufficient Quantity or Quality

Where the topsoil is of insufficient quantity or poor quality for sustaining vegetation, other materials approved by the DOGM in accordance with R645-301-233.100 will be removed as a separate layer from the area to be disturbed, and segregated.

Based on the Soil Survey, there should be sufficient quantities of topsoil to place an average of eight inches of topsoil across all reclaimed areas.

232.300. Shallow Topsoil Handling

If topsoil is less than six inches thick, the operator may remove the topsoil and the unconsolidated materials immediately below the topsoil and treat the mixture as topsoil.

Sufficient quantities of topsoil are estimated to be available for replacement of an average eight inches of topsoil across reclamation, with a minimum of six inches. Therefore, mixing of topsoil with subsoil is not anticipated to be necessary

232.400 - 232.420. Topsoil Removal Exceptions

UDOGM will not require the removal of topsoil for minor disturbances which occur at the site of small structures, such as power poles, signs, or fence lines. Removal of topsoil will not be required when the disturbances will not destroy the existing vegetation and will not cause erosion.

232.500. Subsoil Segregation

The Coal Hollow Project plans to remove soils as either topsoil or subsoil based on the completed soil survey. DOGM may require that the B horizon, C horizon, or other underlying strata, or portions thereof, be removed and segregated, stockpiled, and redistributed as subsoil in accordance with the requirements of R645-301-234 and R645-301-242 if it finds that such subsoil layers are necessary to comply with the revegetation requirements of R645-301-353 through R645-301-357.

Refer to Table 4-2 in Appendix 2-1, which contains estimated subsoil salvage depths. In addition, substitute subsoil has been identified in the layers between the identified topsoil layer and the Tropic Shale. Sufficient quantities of this material are available to live haul most of the subsoil with the exception of one stockpile that will be constructed from the initial mining area and reserved for reclamation of the final mining area. All substitute subsoil materials will be sampled and tested for pH, conductivity, SAR, percent lime, and texture, prior to salvage and stockpiling.

The following soil sampling program will be conducted during the initial mining process:

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- Topsoil: Sampling will occur every 2 to 4 acres or approximately every 2,500 to 5,000 bank cubic yards.
- Subsoil: Sampling will occur every 2 to 3 acres or approximately every 10,000 to 15,000 bank cubic yards.

These samples are anticipated to be composites of individual samples taken throughout the week during the time frames that topsoil and subsoil are being salvaged. These individual samples would be taken five days a week and composited to a single sample representing the material moved each week. The parameters that will be analyzed for topsoil are found in Table 4-1 of Appendix 2-1.

Following the initial mining process (approximately 1 year), this sampling program will be reviewed to determine the appropriate level of sampling necessary to ensure adequacy of topsoil and subsoil used in reclamation for all subsequent mining.

232.600. Timing

All material to be removed under R645-301-232 will be removed after the vegetative cover that would interfere with its salvage is cleared from the area to be disturbed, but before any drilling, blasting, mining, or other surface disturbance takes place. Drawing 2-2 shows the anticipated topsoil removal sequence and stockpiling.

232.700. Topsoil & Subsoil Removal Under Adverse Conditions

An exception to the requirements of R645-301-232 to remove topsoil or subsoils in a separate layer from an area to be disturbed by surface operations may be granted by UDOGM where the operator can demonstrate;

232.710. Unsafe Conditions

The removal of soils in a separate layer from the area by the use of conventional machines would be unsafe or impractical because of the slope or other conditions of the terrain or because of the rockiness or limited depth of the soils.

These conditions are not anticipated in the Coal Hollow project area.

232.720. Lack of On-Site Material Available

If the requirements of R645-301-233 have been or will be fulfilled with regard to the use of substitute soil materials unless no available substitute material can be made suitable for achieving the revegetation standards of R645-301-356, then the operator will, as a condition of the permit, be required to import soil material of the quality and quantity necessary to achieve such revegetation standards.

The soil survey indicates that there are sufficient quantities of topsoil and subsoil to adequately reclaim the mined area with 48 inches of combined cover. If additional materials are needed, then Alton Coal Development (ACD) will salvage suitable overburden for use as substitute subsoil material from the zone below the topsoil layer

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(8 inches thick average) to a maximum depth of 30 feet, excluding any Tropic shale materials. ACD will do additional sampling to identify the zones in which suitable materials occur for maximum salvage potential of substitute subsoil. Representative overburden samples will be analyzed for pH, conductivity, SAR, percent lime, and texture. A detailed description of subsoil sampling is provided in Section 232.500.

233.100 - 400 Topsoil Substitutes and Supplements.

Based on the Soil Survey contained in Appendix 2-1, topsoil substitutes and supplements are not anticipated to be necessary. This survey estimates that nine inches of topsoil can be replaced across the reclamation area.

234. Topsoil Storage

234.100. Stockpiles

Materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 will be segregated and stockpiled when it is impractical to redistribute such materials promptly on regraded areas. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size.

234.200. Requirements of Stockpiles

Stockpiled materials will be subject to the following conditions.

234.210. (a) They will be selectively placed on a stable site within the permit area. Areas are shown on Drawing 2-2.

234.220. (b) They will be protected from contaminants and unnecessary compaction that would interfere with revegetation.

234.230. (c) They will be protected from wind and water erosion through prompt establishment and maintenance of an effective, quick growing vegetative cover or through other measures approved by the UDOGM. The side slopes will be graded to a maximum 3h:1v. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size. The interim seed mix for the stockpiles is the following:

Stockpile Interim Seed Mix		
		Rate (PLS/Acre)
Bromus carinatus	Mountain Brome	6
Elymus lanceolatus	Thickspike wheatgrass	4
Elymus amithii	Western wheatgrass	5
Elymus spicatus	Bluebunch wheatgrass	6
Poa pratensis	Kentucky bluegrass	0.4
Total		**21.40**

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234.240. (d) They will not be moved until required for redistribution unless approved by the UDOGM. Anticipated storage time for each stockpile is shown on Drawing 2-2.

234.300. Long-Term Disturbance & Stockpiling

When long-term disturbed areas will result from facilities and preparation plants and when stockpiling of materials removed under 8645-301-232.100 would be detrimental to the quality or quantity of those materials, DOGM may approve the temporary distribution of the soil materials removed to an approved site within the permit area to enhance the current use of that site until later when needed for reclamation, provided that the following conditions occur.

234.310. Such action will not permanently diminish the capability of the topsoil of the host site.

234.320. The material will be retained in a condition more suitable for redistribution than if stockpiled.

240. Reclamation Plan (General Requirements)

A detailed Order 2 soil survey has been completed in 2006 and 2007. This information provides detail for onsite soil suitability, salvage depths, and volumes available for reclamation of the mine site. Dozers or Scrapers will replace the subsoil and topsoil. The topsoil is estimated to average 8 inches and the subsoil will be approximately 39 inches in thickness. The total profile of topsoil and subsoil is estimated to average 48 inches.

242. Soil Redistribution

242.100. Topsoil materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 and stored under R645-30I-234 will be redistributed in a manner that meets the following conditions.

242.110. (a) The material achieves an approximately uniform, stable thickness consistent with the approved postmining land use, contours, and surface-water drainage systems. All slopes will be appropriately graded and leveled prior to placement of topsoil and subsoil layers. Soil layer thicknesses will be regularly checked using a high precision GPS system and spot checking by the ACD environmental technician.

242.120. (b) Reduced material handling of the soil resource prevents excess compaction. Material handling will be minimized by direct hauling and placing materials when operationally practical rather than stockpiling. Materials will be spread by a dozer or scrapers and spread only as much as necessary to obtain the required uniform thickness. Traffic from rubber tired equipment across topsoil and subsoil will be minimized.

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If heavy equipment operation results in excessive soil compaction at the surface of the reclaimed areas, they will then be ripped, disked, and harrowed to loosen the seedbed prior to seeding. Excessive compaction that could impact seeding success will be determined by observation and judgment of an environmental professional. In other areas where less compaction has occurred, the areas will be disked and harrowed. The disking and harrowing of all areas will be done parallel with the contour wherever possible to decrease the potential for water erosion downslope. In other areas where compaction is not a problem, dozer tracking can be used to roughen the surface, and to trap seed, fertilizer, mulch, and other amendments as well as decrease erosion by wind and water. In such cases seeding will be done immediately after this treatment, whereas soil amendments, where required, would be applied over the surface during seedbed preparations. Seeding will mainly occur in the early spring and late fall. Seeding will be accomplished by the seed drilling method followed by mulching as described in Section 244.200. Seed mixtures and rates can be viewed in Tables 3-37 through 3-42 in Chapter 3, Volume 2.

242.130. (c) Handling procedures will be implemented to protect the materials from wind and water erosion before and after seeding and planting. Reclamation will be graded to the planned slope angles, not to exceed 3h:1v. Soil layers will sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. If the season is not appropriate for seeding at the time of topsoil placement, the topsoil will then be coated with a tackifier at the manufacturer's suggested rate for dust control applications. Mulching will be implemented on all reclamation to control erosion following seeding.

242.200. Treatments of Material to be Redistributed

Before redistribution of the materials removed under R645-301-232, the regraded land will be treated if necessary to reduce potential slippage of the redistributed material and to promote root penetration. If no harm will be caused to the redistributed material and reestablished vegetation, such treatment may be conducted after the material is replaced. Potential for slippage is anticipated to be minimal based on the planned slope angles for reclamation.

242.300. Soil Redistribution on Impoundments & Roads

DOGM may not require the redistribution of topsoil or topsoil substitutes on the approved postmining embankments of permanent impoundments or roads if it determines the following.

242.310. (a) Placement of topsoil or topsoil substitutes on such embankments is inconsistent with the requirement to use the best technology currently available to prevent sedimentation.

242.320. (b) Such embankments will be otherwise stabilized.

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243. Soil Nutrients & Amendments

Nutrients and soil amendments will be applied to the redistributed material when necessary to establish the vegetative cover. The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil. Next, a basic topsoil (top 8 inches of reclamation profile) sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

Available phosphorus (P)
Soluble Potassium (K)
Nitrate-Nitrogen

One composite sample will be collected from approximately every 2 to 5 acres based on soil types and variability. Each composite will be comprised of at least 4 su-samples.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1 (native topsoil and subsoil) and Table C-2 (samples from core hole/overburden pits) of Appendix 2-1.

244. Soil Stabilization

244.100. Erosion Protection from Wind & Water

All exposed surface areas will be protected and stabilized to effectively control erosion and air pollution attendant to erosion. Reclamation will be regraded to the planned slope angles, not to exceed 3h:1v. Soil layers will be sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. Grass matting, mulching and/or cross ditches will be implemented as necessary to control erosion. Surfaces of stockpiles will be roughened by pocking, gouging or ripping. Temporary stockpiles that will be in place for more than 1 year will be seeded with the temporary seed mix provided in Section 234.230 and mulched by one of the methods described in Section 244.200. Temporary stockpiles that will be in place for less than one year will be coated with a tackifier at the manufacturer's suggested rate for dust control applications.

244.200. Mulch

Suitable mulch and other soil stabilizing practices will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes. DOGM may waive this requirement if seasonal, soil, or slope factors result in a condition where mulch and other soil stabilizing practices are not necessary to control erosion and to promptly establish an effective vegetative cover.

Mulch will be placed on the seedbed surface once soil amendments have been

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incorporated and seeding has been accomplished. Mulching will occur by one of the following methods:

- Certified noxious weed free straw applied at a rate of 1 ton/acre anchored by crimping or a chemical binder.
- Wood fiber hydromulch at a rate of ¾ ton per acre for slopes flatter than 3:1 and 1 ton per acre for slopes at 3:1 which is the steepest slope planned at the project. This hydromulch would be anchored with a chemical binder at the manufacturer's suggested rate.

The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Since there is only one post mining land use, mulching will follow one of the above described methods for all reclaim areas.

244.300. Rills & Gullies

Rills and gullies that form in areas that have been regraded and topsoiled that cause the following conditions will have the topsoil replaced followed by reseeding or replanting if the following occurs.

244.310. (a) If they disrupt the approved postmining land use or the reestablishment of the vegetative cover.

244.320. (b) If they cause or contribute to a violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized; topsoil will be replaced; and the areas will be reseeded or planted.

250. PERFORMANCE STANDARDS

251. Topsoil & Subsoil Removed

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.

252. Topsoil & Subsoil Stockpiled

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.

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Order 2 Soil Survey

of

Coal Hollow Mine Disturbance Area

Located near Alton, Utah

Prepared for Alton Coal Development, LLC

By

Long Resource Consultants, Inc.

Morgan, Utah

January 15, 2008

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Coal Hollow Mine
Soil Survey

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Purpose of Soil Survey

The purpose of this report is to summarize the results of an order 2 soils inventory conducted for Alton Coal Development, LLC (ACD) in an area proposed for development of a surface coal mine, Coal Hollow Project, in Kane County, approximately 2.5 miles south southeast of Alton, Utah. The survey area is on private lands owned or leased by ACD. This soil survey was prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3) develop a post mining reclamation plan using salvaged soil materials. This soil survey covers 630 acres.

Project Area

The Coal Hollow Project soil survey area is located in the Sink Valley portion of the Alton Amphitheater, figures 1-1 and 1-2. It is bounded on the northeast and east by the Paunsaugunt Plateau and by the Markagunt Plateau on the northwest. Black Mountain separates Sink Valley from Long Valley on the west. It is bounded on the south by the Skutumpah Terrace The project area includes portions of the southwest quarter of section 19, southeast quarter of section 20, west quarter of section 29, and east quarter of section 30 in Township 39 south, Range 5 west, Salt Lake Base meridian. Elevation ranges from approximately 6,840 to 7,100 feet.

The ACD soil survey area is drained by Lower Robinson Creek and Sink Valley Wash which flow into Kanab Creek (iGage, 1999).

Native vegetation in the ACD soil survey area consists of Utah juniper, pinyon pine, big sagebrush, and wet meadows. Portions of the project area were previously cleared of Utah juniper, pinyon pine, and sagebrush and planted to non-irrigated grass pasture.

Climate

An official U.S. Weather Bureau station is located in Alton, Utah. The period of available records for this station is January 1, 1928 through October 31, 2006 (Western Regional Climate Center, April 2007). Average annual precipitation is 16.43 inches and is evenly distributed throughout the year. The average annual air temperature is 45.7 °F. The precipitation pattern is ustic and soil temperature regime is mesic (C. Meir, 2006 AND V. Parslow, 2007) bordering on frigid. Table 1-1 contains a summary of weather data for Alton, Utah. Summers are warm with cool nights.

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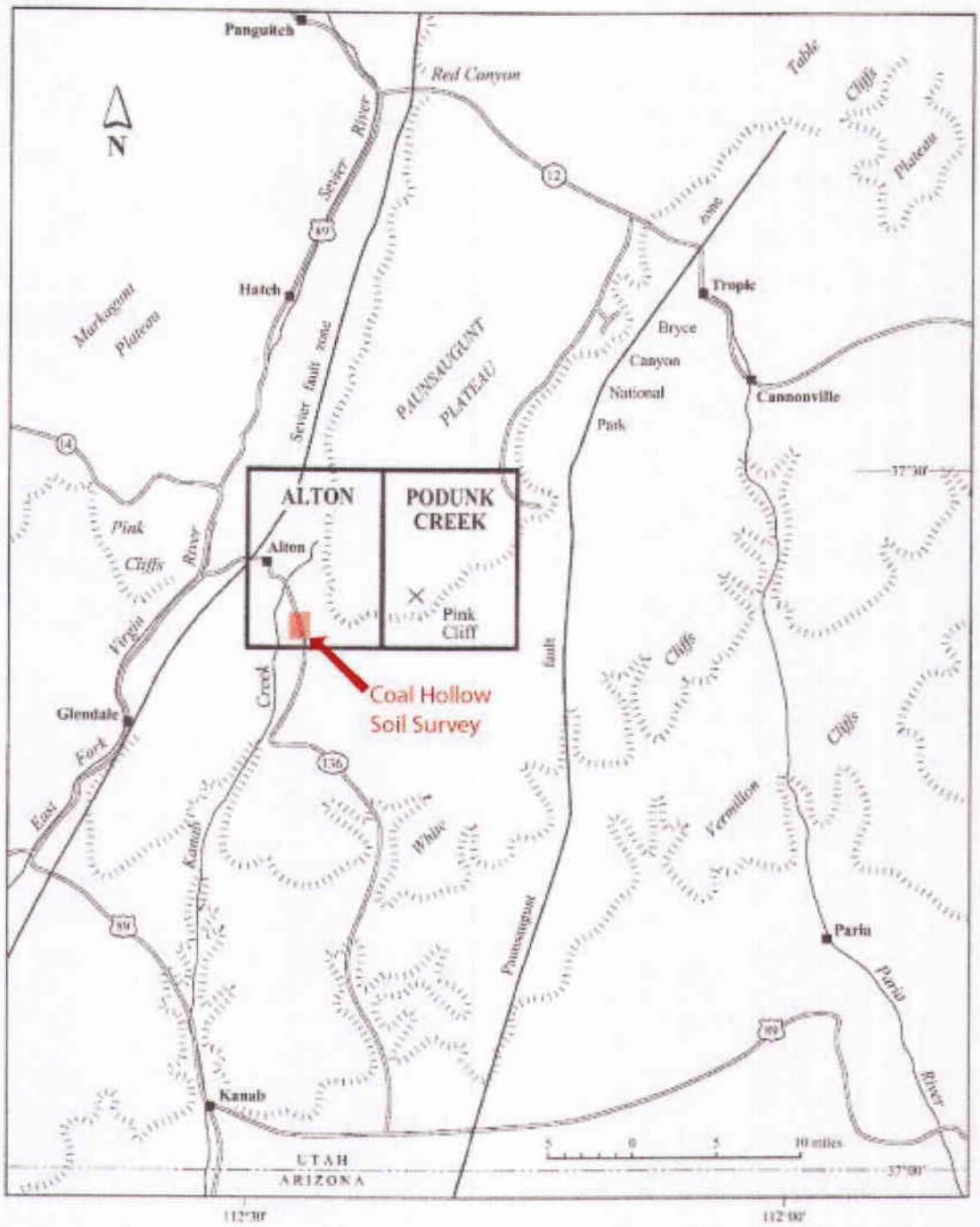

Figure 1. Index map of the Paunsaugunt Plateau region, showing the Alton and Podunk Creek quadrangles. The highest point (Pink Cliff) and only settlement in the study area (Alton) are indicated. The quadrangles were mapped together. The map is adapted from Gregory (1951, p. 3).

Figure 1-1. General location of Coal Hollow Soil Survey area. Location and shape are approximate. Base map is index map of Paunsaugunt Plateau region (Utah Geological Survey, 2001).

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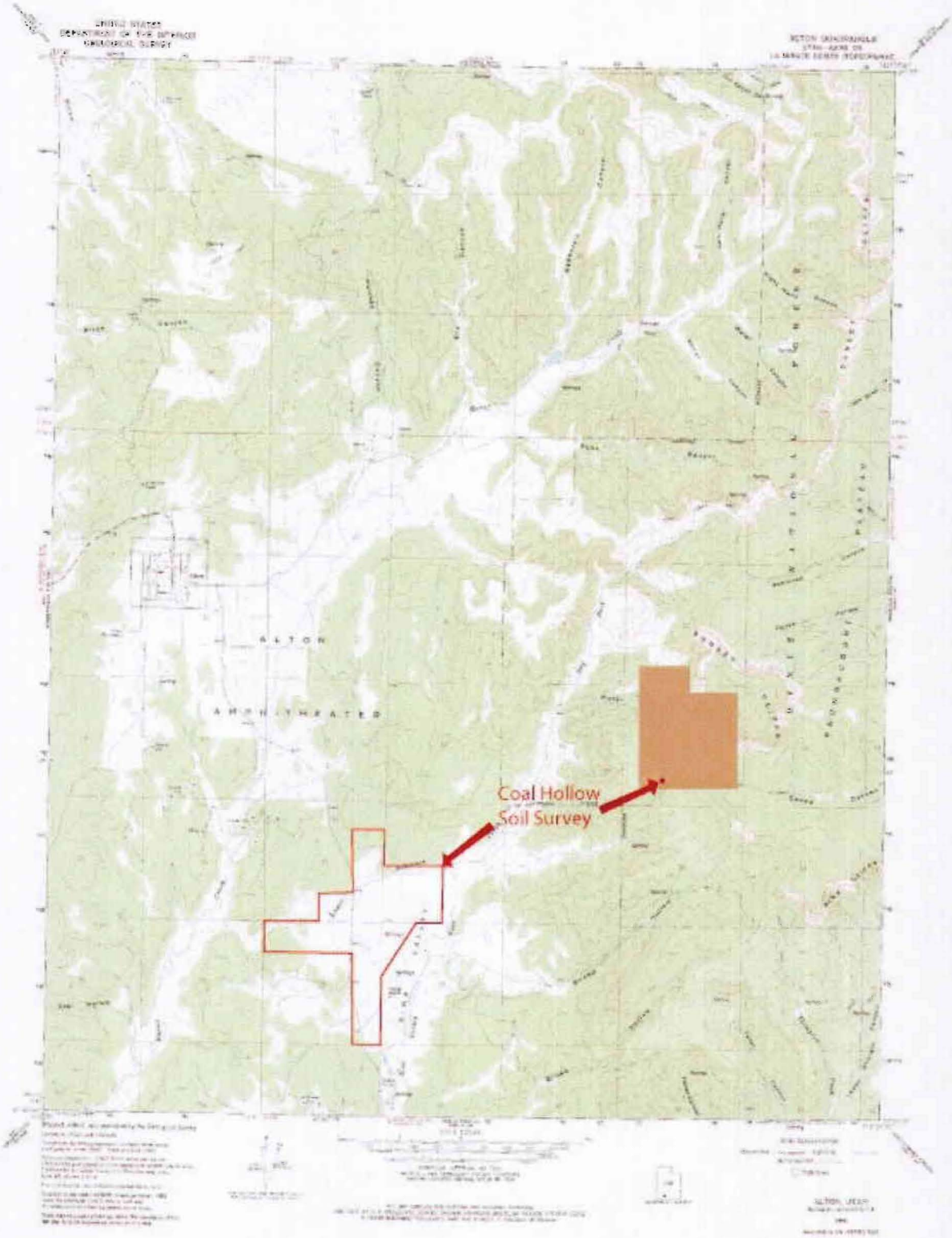

Figure 1-2. Location of Coal Hollow Soil Survey area south of Alton, Utah. Location is approximate. Base map is Alton, Utah quadrangle (iGage, 1999).

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Table 1-1. Summary of weather data for Alton, Utah.

	Ave Max Temp (F)	Ave Min Temp (F)	Ave Total Precip (in)	Ave. Total Snowfall (in)	Ave Total Snow Depth (in)
January	39.6	15.1	1.79	21.1	6
February	42.2	17.5	1.79	19.2	8
March	47.8	21.8	1.57	14.5	5
April	57.7	28.0	1.05	4.4	1
May	67.3	34.8	0.84	0.6	0
June	76.8	42.0	0.56	0.1	0
July	82.7	49.8	1.42	0.0	0
August	80.4	48.9	1.74	0.0	0
September	73.9	41.8	1.49	0.0	0
October	63.0	33.0	1.43	1.3	0
November	49.9	23.0	1.23	6.6	1
December	41.8	16.8	1.52	15.4	2
Annual	60.3	31.0	16.43	83.3	2

Source: Western Regional Climate Center, April 2007.

How the Soil Survey was Made

This soil survey was made in accordance with the guidelines for an order II soil survey as detailed in the Soil Survey manual (USDA 1993). Soils were classified to the taxonomic family using the Keys to Soil Taxonomy, Ninth Edition (USDA 2003). The dominant soil sub-groups identified in the Coal Hollow soil survey area are Aridic Calciustepts, Aridic Calciustolls, Calcidic Haplustalfs, Aeric Epiaquepts, and Aridic Ustorthents. Tables of the taxonomic classification of the soil profiles are contained in appendix B.

Twenty three soil types were identified in the soil survey area. Seven soil types could be correlated to existing soil series (Soil Survey Staff, 2007). Ten soil types were correlated to existing soil series names at the family level. There were no established soil series names at the soil family level for the remaining six soil types, so they were assigned letters (e.g. A Soils Family) for simplified identification is the soils legend.

Field Evaluation of Soils

Soil pedon descriptions were completed for representative backhoe pits dug in September and November 2006 and in March, April, and September 2007. Pits in very deep soils were dug to a minimum 60 inches unless bedrock or wet soil conditions were limiting. But most soil pits were dug and described to 84 inches or deeper. Two soil pits in soils less than 20 inches deep were hand dug. Soil

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pedon log sheets were completed for each soil pit using the methods detailed in the *Field Book for Describing and Sampling Soils*, version 2 (Schoeneberger et. al., 2002). Soil pits 1 through 42 were described by Bruce Chesler, soil scientist (B. Chesler, 2007). Soil pits 43 through 50 were described by Robert Long, Certified Professional Soil Scientist.

Aerial photographs (1:15,000 and 1:7,200) were used to delineate soil map unit boundaries based on slope gradient, geomorphic features, and vegetation. The aerial photography was taken in July 2006 by Olympus Aerial Surveys, Inc., Salt Lake City, Utah. A mirror stereoscope was used to view paired photo images.

Samples of soil horizons were collected in gallon size plastic bags and in micro-monolith boxes. The box samples were used for further determination of soil profile characteristics.

Analysis of Soil Samples

Soil samples (145) from 27 representative soil profiles that were collected during September 12-19, 2006 were shipped on September 25 and October 2, 2006 to Inter-mountain Laboratories in Sheridan, Wyoming for chemical and physical analysis. Each of the soil samples were analyzed for the parameters outlined by the Utah Division of Oil Gas and Mining's (DOGM) *Guidelines for Management of Topsoil and Overburden* (DOGM, 2005), Table 1-2.

Soil samples (32) collected during November 2006 and March 2007 from 8 representative soil profiles were shipped to Energy Labs in Casper, Wyoming for analysis of the topsoil suitability parameters listed in table 1-2 on March 29, 2007.

Five soil samples collected from two shallow soil pits were shipped to Energy Labs in Casper, Wyoming for analysis of the topsoil suitability parameters listed in table 1-2 on April 11, 2007.

Table 1-2. Soil analysis parameters for topsoil and overburden (Utah DOGM, 2005).

Topsoil Suitability Parameters	
Paste pH Saturation percent Electrical Conductivity (ECe) Soluble Na, K, Mg, and Ca Sodium Adsorption Ratio	Available Phosphorus Particle Size Analysis (% very fine sand, sand, silt, and clay) Organic Matter Percent CaCo3 Percent Extractable Potassium
Additional Analyses for Topsoil and Overburden	
Soluble Selenium Alkalinity	Soluble Boron

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Laboratory data reports of the soil sample analyses are in Appendix B.

Geology and Setting

The Coal Hollow soil survey area is located in Sink Valley in the western part of the Alton Amphitheater southwest of the Paunsaugunt Plateau. Quaternary alluvium (Qa), Tropic shale (Kt), Dakota sandstone (Kd), and the Tibbet Canyon sandstone (Kst) member of the Straight Cliffs Formation are the primary sources of parent material in the soil survey area. Figure 1-3 illustrates geologic formations and features in the soil survey area (Utah Geological Survey, 2001). The Sink Valley fault runs north south through the Coal Hollow Soil Survey area (Utah Geological Survey, 2001).

Quaternary alluvium (Qa) consists of unconsolidated clay, silt, sand, and gravel deposits located in fan alluvium and terrace deposits of Holocene age (Utah Geological Survey, 2001). The primary sources of the Quaternary alluvium is the Tropic shale (Kt), Smoky Hollow sandstone member of the Straight Cliffs formation, John Henry sandstone member of the Straight Cliffs formation, and the Drip Tank sandstone member of the Straight Cliffs formation (Utah Geological Survey, 2001). Soils developed from Quaternary alluvium are situated on a large alluvial fan that flowed out of the Robinson Creek drainage and unnamed smaller drainages and across the Sink Valley fault.

Tropic shale (Kt) is a member of the Upper Cretataceous formation and is also referred to as Moncos shale (Hintze, 1977). It is a medium-brownish-gray to medium dark-gray, very thin-bedded, silty shale. Soils developed from Tropic shale are primarily east of the Sink Valley fault (Utah Geological Survey, 2001). Seeps on top of the Tropic shale have resulted in the development of aquic soils. Shallow soils have developed in Tropic shale along the Sink Valley fault escarpment.

Dakota sandstone (Kd) consists of interbeded yellowish-gray and brown sandstone, gray mudstone, black carbonaceous mudstone and coal, and some bentonite (Utah Geological Survey, 2001). Shallow and moderately deep soils have developed in Dakota sandstone at the east ends of the soil survey area where it is intermingled with Tropic shale.

Tibbet Canyon sandstone (Kst) consists of orangish-gray-weathering sandstone that intermingles with the underlying Tropic shale (Utah Geological Survey, 2001). Shallow and moderately deep soils have developed in Tibbet Canyon sandstone at the north end of the soil survey area.

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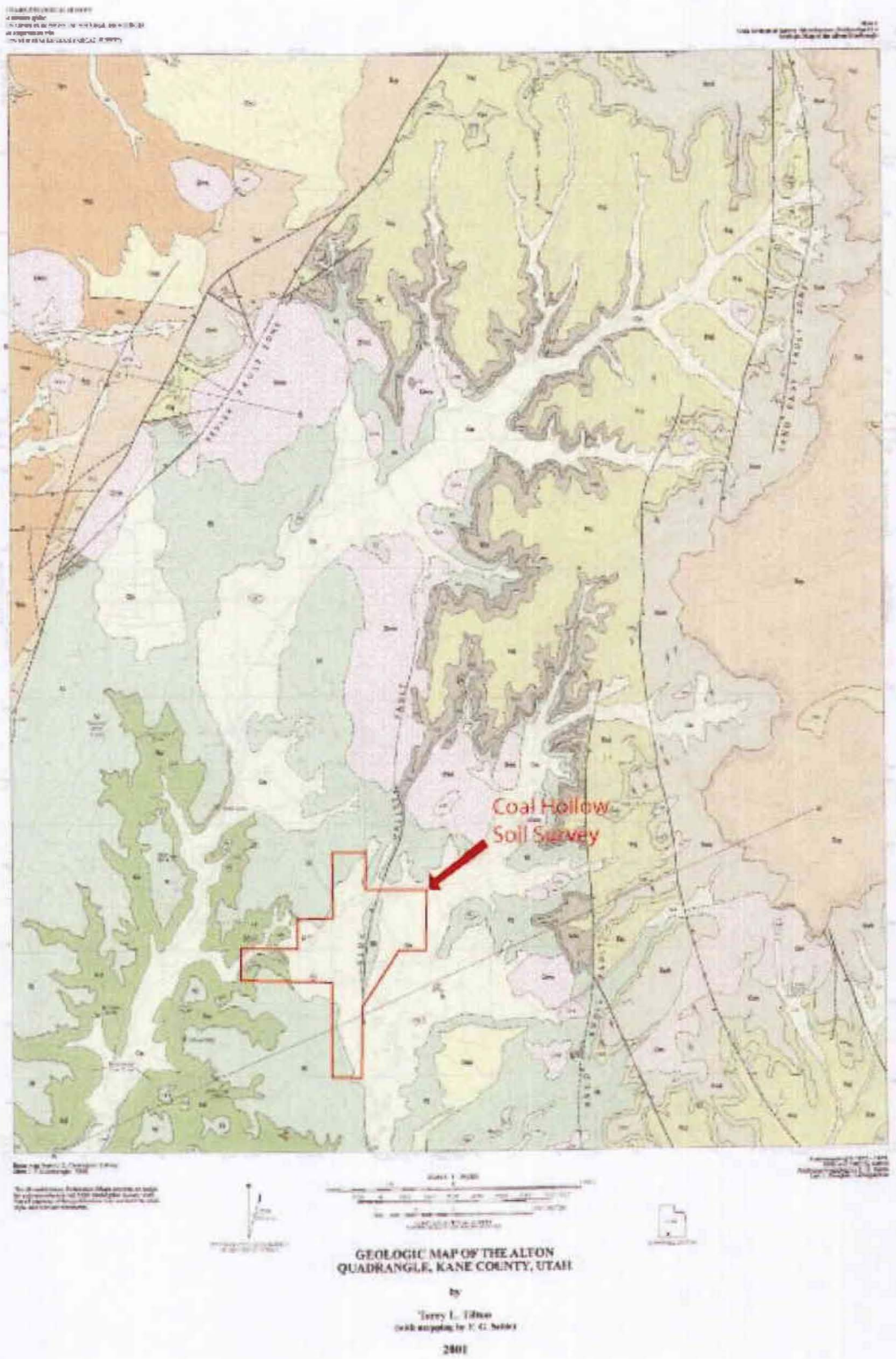

Figure 1-3. Alton quadrangle geological map showing location of Coal Hollow Soil Survey (Utah Geological Survey, 2001).

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Prime Farmland

The Natural Resource Conservation Service conducted a prime farmland assessment in October 2006 and determined that "No Prime Farmland or Soils of Statewide Importance were found within the study area (Coal Hollow Mine area), per criteria outlined in the National Survey Handbook Part 622 and Exhibit UT603-1, respectively (C. Meier, 2006)." The assessment stated that the soils "..could classify as Soils of Statewide Importance, if irrigated."

"An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI (C. Meier, 2006)."

"In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability (C. Meier, 2006)."

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Soil Survey Legend

Soils in the Coal Hollow project soil survey area have been grouped into thirteen soil map units based on taxonomic classification, depth to parent material, and slope. The composition of these map units is described in table 2-1. Detailed descriptions of each soil map unit are included in this section. The Coal Hollow soil survey map is Drawing 2-1.

Typifying soil profile descriptions for each soil type are in section 3 of this soil survey.

Soil profile description sheets are in appendix B.

Results of laboratory analysis of representative soil samples for each soil type are in appendix C.

1 A Family – Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 1 is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997). The depth to Tropic shale is greater than 40 inches in the major soils (A and Wapiti soil families), but minor inclusions with Tropic shale from 20 to 40 inches deep occur. The map unit is dominated by big sagebrush and grasses.

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities and establish topsoil and subsoil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1*
20	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
10	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	33
5	M	fine, mixed, superactive, mesic Aridic Haplustepts	26

* Lab analysis of typifying soil pedon for map unit.

Map unit 1 description is continued on page 2-5.

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Table 2-1. Soil map unit composition for the Coal Hollow project area.

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
1		**A Family – Wapiti Family complex, 3 to 8 percent slopes**		
	65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
	10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
	5	Manzanst Family	fine, mixed, superactive, mesic Aridic Haplustalf	48
	5	N Family	fine, mixed, superactive, frigid Aquic Calciustoll	26
2		**M Family - Calendar Family – D Family complex, 3 to 8 percent slopes**		
	60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3
	25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4
	15	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	2
3		**Cibeque Family – Wapiti Familiy complex, 3 to 8 percent slopes**		
	60	Cibeque Family	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6
	30	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
4		**Jonale Family - Graystone Cobbly Substratum Family - Wapiti Family complex, 3 to 8 percent slopes**		
	50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17
	25	Graystone cobbly substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19
	5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	

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Table 2-1. Soil map unit composition for the Coal Hollow project area.

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
5		**Calendar Family - M Family – Drifity Family complex, 8 to 25 percent slopes**		
	40	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24
	30	M Family	fine, mixed, superactive, mesic Aridic Calciustept	25
	20	Drifity Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49
	10	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
6		**Graystone - Cookcan – Jonale Family complex, 1 to 5 percent slopes**		
	45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15
	20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B
	20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16
	15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14
7		**Happyhollow Family - Alamosa complex, 1 to 5 percent slopes**		
	55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38
	20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A
	10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
	10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40
	3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
	2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
8		**Brumley – Graystone - Snilloc complex, 3 to 8 percent slopes**		
	40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22
	30	Graystone Cobbly Substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20
	20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21
	10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

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Table 2-1. Soil map unit composition for the Coal Hollow project area.

Map Unit	Percent	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
9		**D Family - Deacon complex, 5 to 30 percent slopes**		
	55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41
	30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42
	10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5		Creek bottom	
10		**Zigzag clay, 8 to 25 percent slopes**		
	85	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	50
	10	Drifity Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
11		**A family clay, 8 to 25 percent slopes**		
	85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28
	10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
	5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
12		**Manzanst Taxadjunct Family clay, 3 to 12 percent slopes**		
	85	Manzanst Family	very fine, mixed, superactive, mesic Aridic Haplustalf	48
	10	Manzanst Family Deep	very fine, mixed, superactive, mesic Aridic Haplustalf	60
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
13		**A Family – Happyhollow Family complex, 1 to 5 percent slopes**		
	80	A Family	fine, mixed, superactive, mesic Aridic Calciustept	59
	15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
	5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52

1 Soil families were given letter designations, because it was not possible to correlate the soils to established soil series since no NRCS published or SSURGO certified soil survey data exists in or adjacent to the Coal Hollow project area. Assignment of soil type letters enables comparison of map units and simplifies map unit names.

2 Soil families classified using Keys to Soil Taxonomy, Tenth Edition (NRCS 2006).

3 Soil pedon described within map unit boundaries that represents the characteristics of the soil family within the soil map unit.

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Map Unit 1, continued from page 2-1

Typifying Soil Pedon Descriptions

Soil colors are for dry soil unless specified otherwise.

The typifying soil pedon for A family soils in map unit 1 is soil pedon 1. The surface is a grayish brown clay loam 12 inches thick, dark grayish brown (moist). The subsoil (calcic) consists of light brownish gray silty clay, light olive brown (moist). Decomposing Tropic shale occurs at 42 inches below the surface.

The typifying soil pedon for the Wapiti family soils in map unit 1 is soil pedon 32. The mollic surface is a brown loam 8 inches thick, very dark grayish brown (moist). The subsurface (argillic) is a pale brown clay loam and silty clay, brown (moist). The subsoil (calcic) is pink loam to 6 feet, brown (moist). The underlying soil to nearly 12 feet is light yellowish brown silty clay over pink coarse sands with 10 percent faint strong brown mottles.

Supporting Soil Pedons

Soil family A is also represented by soil pits 27 and 30 in map unit A. Soil pit 27 does not have Tropic shale within 140 inches of the surface. Soil pit 30 has decomposing Tropic shale at 105 inches below the surface.

Laboratory Analysis

Analysis of soil samples from soil pit 1 had a poor soil pH (8.7) from 24 to 42 inches and fair lime percents (22.6 to 28.3 percent) throughout the soil profile. The silty clay texture at 24 inches is in the poor category for texture. SAR increases gradually with depth to 4.02 in the 24 to 42 inch horizon and then reaches 12.3 in the tropic shale below 42 inches.

Soil Inclusions

Small inclusions of D Family and N Family soils occur within map unit 1. D Family soils are similar to the A Family soils, but have a mollic epipedon (dark surface). The N family soils are very deep, similar to the D Family soil, but have aquic soil conditions below 20 inches and are located in concave depressions within map unit 1.

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2 M Family – Calendar Family - D Family complex, 3 to 8 percent slopes

General Description

This map unit is dominated by soils with Tropic shale parent material at 20 to 72 inches below the surface. The map unit is dominated by big sagebrush and grasses with some pinyon pine and Utah juniper encroaching along edges of the map unit near map unit 5. This map unit is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997).

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities. A second small delineation of map unit 2 occurs along the south boundary of the proposed year 1 mining area west of the county road.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3*
25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4*
15	D family	fine, mixed, superactive, mesic Aridic Calciustoll	2*

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for M family soils in map unit 2 is soil pedon 3. The surface is a brown loam 4 inches thick, dark brown (moist). The subsurface (cambic) is a grayish brown clay loam and silty clay loam 15 inches thick, brown (moist). The underlying subsoil to 33 inches is light brownish gray silty clay, light olive brown (moist). Tropic shale parent material occurs at 33 inches below the surface.

The typifying soil pedon for Calendar family soils in map unit 2 is pedon 4. The surface is pale brown silty clay 4 inches thick, dark grayish brown (moist). The subsurface (cambic) is light brownish gray silty clay moderate to strong structure, dark grayish brown (moist) to 31 inches. Tropic shale parent material occurs at 31 inches.

The typifying soil pedon for D family soils in map unit 2 is pedon 2. The surface (mollic) is brown clay loam 12 inches thick, very dark grayish brown (moist). The subsurface (cambic and calcic) is pale brown silty clay and clay to 48 inches deep, brown (moist). The subsoil is white silty clay to 72 inches, brown (moist). Tropic shale parent material occurs at 72 inches below the surface.

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Supporting Soil Pedons

Soil pedon 12 is representative of soil type M and is located in the delineation of map unit 2 along the south boundary of the year 1 mining area. The depth to Tropic shale in pedon 12 is 26 inches.

Laboratory Analysis

The main limiting feature of soils in map unit 2 is an increase of conductivity and SAR into the fair range as the soil depth reaches the interface with Tropic shale. The percent lime in the soil ranges from 18.6 to 27.5 above the Tropic shale. The saturation percentage increases with the percent clay, but remains in the fair range even with the clay and silty clay.

3 Cibeque Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 3 is characterized by very deep soils that show some indication of alluvial deposition most likely from the large alluvial fan that formed this portion of Sink Valley. Recent soil deposition from nearby Robinson Creek is indicated in pedon 6 by an increase of organic matter at 12 inches below the soil surface.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	Cibeque	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6*
30	Wapiti	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Cibeque family soils in map unit 3 is soil pedon 6. The surface is brown loamy sand 12 inches thick, dark yellowish brown (moist). The subsoil (calcic) is pale brown loam and sandy loam to 34 inches deep, brown (moist). The underlying soil to 60 inches is light grayish brown silty clay, brown (moist).

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The typifying soil pedon for Wapiti family in map unit 3 is soil pedon 31. The surface (mollic) is dark grayish brown loam 7 inches thick, dark brown (moist). The subsurface (argillic) is light yellowish brown clay loam to 17 inches, dark yellowish brown (moist). The subsoil (lower argillic and calcic) is light brownish gray and brown clay loam and loam to 52 inches, grayish brown and brown (moist). The underlying soil to 110 inches is very pale brown sandy loam and loamy sand, brown and yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 13 is representative of Cibeque family in map unit 3.

Laboratory Analysis

Soil pH increases to the fair category (8.3 to 8.5) at 6 inches below the surface in pedon 6. The soil pH is consistent with percent lime in fair category (18.4 to 29.2). The loamy sand surface has a fair water holding capacity. Organic matter has an irregular increase at 12 inches from 0.7 in the A2 horizon to 2.6 in the upper Bk horizon.

Soil Inclusions

Small inclusions of A and Calendar soil families occur in map unit 3. A family soils are similar to Cibeque soils, but have a higher percentage of clay in the control section (10 to 40 inches). Calendar soils are very deep but do not have either an argillic horizon (increase in illuvial clays) or a calcic horizon within 40 inches of the soil surface.

4 Jonale Family – Graystone cobbly substratum Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 4 is characterized by very deep fine-loamy and coarse-loamy soils with mollic epipedons and calcic horizons. Lime accumulations below 12 to 22 inches are common in these soils. Soil pH is strongly alkaline below 22 inches in some soils. Vegetation in this map unit is big sagebrush and grasses.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17*
25	Graystone cobbly substratum family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39*
15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19*
5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	7*
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Jonale family in map unit 4 is soil pedon 17. The surface (mollic) is a brown clay loam 9 inches thick, dark brown (moist). The subsurface (cambic) is a pale brown clay loam to 18 inches, brown (moist). The lower subsurface (Bwk) to 45 inches is light yellowish brown loam and clay loam, dark yellowish brown (moist). The underlying subsoil (calcic) is very pale brown clay loam and silty clay to 80 inches, yellowish brown (moist).

The typifying soil pedon for Graystone cobbly substratum family in map unit 4 is soil pedon 39. The surface is brown clay loam 12 inches thick, dark brown (moist). The subsurface (calcic) is a very pale brown to light yellowish brown sandy loam to 36 inches deep, yellowish brown (moist) with 0 to 15 percent gravels and cobbles. The underlying subsoil is very pale brown very cobbly loamy sand to 75 inches, brown (moist).

The typifying soil pedon for Wapiti family in map unit 4 is soil pedon 19. The surface (mollic) is a grayish brown loam 6 inches thick, very dark grayish brown (moist). The subsurface (upper argillic) is a brown and pale brown clay loam to 24 inches deep, dark grayish brown and yellowish brown (moist). The lower subsurface (lower argillic and upper calcic, Btk) is a pale brown loam to 37 inches deep, brown (moist). The underlying subsoil (calcic) is a pale brown and light yellowish brown sandy loam to 90 inches deep, yellowish brown (moist).

Supporting Soil Pedons

Jonale family is represented by soil pedons 5, 8, 10, 18B, 23, 34, and 35. Soil family H is represented by soil pedons 11, 36, and 37.

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Laboratory Analysis

Jonale soil family is characterized by soil pH in the poor range of 8.6 to 9.0 (Utah DOGM, 2005) at depths below 22 to 40 inches. This strongly alkaline soil pH corresponds to lime percentages of greater than 30 in this same portion of the soil profile.

Graystone cobbly substratum soil family is dominated by sandy loam and loamy sand textures with some clay loam. Lime accumulation occurs below 12 to 16 inches, but percentages are lower relative to the fine-loamy type C soils. Soil pH becomes strongly alkaline at depths of 48 inches in some pedons. There is 15 to 45 percent gravels and cobbles below 36 inches.

Wapiti soil family has fair levels of carbonates throughout the soil profile. Soil pH was measured as poor below 68" in soil pedon 19.

Soil Inclusions

Soil family D is represented by pedon 7 in map unit 4. There are also small inclusions of soil family A where map unit 4 borders map units 1 and 11.

5 Calendar Family - M Family – Drifity Family complex, 8 to 25 percent slopes

General Description

These soils are moderately deep (20 to 40 inches) to shallow (less than 20 inches to Tropic shale. The moderately deep soils have clayey textures, while the shallow soils are loamy. Vegetation is pinyon pine, Utah juniper, black sage and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24*
30	M family	fine, mixed, superactive, mesic Aridic Calciustept	25*
20	Drifity Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49*
5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	

* Lab analysis of typifying soil pedon for map unit.

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Typifying Soil Pedon Descriptions

The typifying soil pedon for Calendar family in map unit 5 is soil pedon 24. The surface is olive brown clay 5 inches thick, dark grayish brown (moist). The subsurface (cambic) is dark grayish brown and olive clay with moderate to strong blocky structure to 32 inches. Tropic shale parent material is at 32 inches.

The typifying soil pedon for M family in map unit 5 is soil pedon 25. The surface is covered with a half inch of decomposing needles and twigs. The soil surface is light brown clay 5 inches thick, brown (moist). The subsurface (calcic) is brown and strong brown clay with lime accumulations, dark brown (moist). Tropic shale parent material is at 32 inches.

The typifying soil pedon for Drififty family in map unit 5 is soil pedon 49. The surface light yellowish brown silty clay loam 3 inches thick, light olive brown (moist). The subsoil is a light olive brown loam to 10 inches, olive brown (moist). Interbeded sandstone and Tropic shale are at 10 inches.

Laboratory Analysis

Calendar soil family is characterized by percent clay of 44 to 47 with correspondingly high saturation percentages of 73.6 to 91.2. Conductivity increases to 7.8 at 17 inches below the surface.

Soil type M is characterized by percent clay of 40 to 47 with correspondingly high saturation percentages of 58.5 to 80.6 in the upper 20 inches of the soil profile. The percent clay decreases to 33 percent below 20 inches. Lime percentage is greater than 30 in the 5 to 20 inch depth, but less than 5 above and below this zone.

Drififty soil family is characterized by pH of 8.1 to 8.4, lime percentage of 18, and SAR of less than 0.1.

Soil Inclusions

There are some inclusions of Zigzag soils that are shallow (less than 20 inches) to Tropic shale. Zigzag soils are clayey.

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6 Graystone – Cookcan – Jonale Family complex, 1 to 5 percent slopes

General Description

These medium to coarse textured soils are very deep. Wet soil conditions are present at varying depths in all of the map unit soils. The depth to wet soil conditions varies from 14 to 58 inches. This map unit is not a good source of subsoil. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is grasses, sedges, and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15*
20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B*
20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16*
15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14*

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Graystone soils in map unit 6 is soil pedon 15. There is a dense root mat 1 inch thick on the surface. The surface is brown sandy loam 8 inches thick, dark brown (moist). The subsurface (cambic) is pale brown loam with moderate structure, dark yellowish brown (moist) to 20 inches. The subsoil (calcic) is very pale brown loam to 58 inches deep, yellowish brown (moist). The underlying soil is yellow and brownish yellow sandy loam with common prominent mottles to 96 inches, yellowish brown (moist).

The typifying soil pedon for Cookcan soils in map unit 6 is soil pedon 9B. The surface is dark grayish brown loam 6 inches thick, very dark grayish brown (moist). The lower surface is grayish brown sandy clay loam to 14 inches with few faint mottles, dark grayish brown (moist). The subsurface is light brownish gray sandy loam with common prominent mottles, dark gray (moist). The subsoil is light gray sandy loam with many prominent mottles, grayish brown (moist). The soil was wet below 48 inches.

The typifying soil pedon for Jonale soil family in map unit 6 is soil pedon 16. There is a dense root mat 1 ½ inch thick on the surface. The surface is dark grayish brown silty clay loam 8 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 18 inches, strong brown (moist).

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The subsoil is pink clay loam to 36 inches, brown (moist). The lower subsoil is pink silty clay loam and loam with few faint strong brown mottles to 68 inches, brown (moist). The underlying soil is light brownish gray clay loam with common prominent yellowish red mottles, grayish brown (moist).

Supporting Soil Pedons

Soil pedon 9A is similar to Graystone soils, but it has carbonates throughout the soil profile without any zone of accumulation.

Laboratory Analysis

Strongly alkaline soil pH (8.6 to 9.0) within 12 to 20 inches of the soil surface is the main limiting feature of the soils in map unit 6. Soil pedon 9A has very strongly alkaline pH (greater than 9.0) below 12 inches of the surface.

Lime percentage exceeds 30 in 3 of 5 pedons within 12 to 20 inches of the surface. Lime percentage ranges from 15 to 26 in the other two pedons from the surface to 48 inches.

Soil Inclusions

Soil pedon 14 is representative of I family soils within map unit 6 that do not have a mollic epipedon (dark surface) and have aquic (wet) soil conditions within 30 inches of the surface. These soils have a calcic horizon.

7 Happyhollow Family – Alamosa complex, 1 to 5 percent slopes

General Description

This soil map unit is located on a Tropic shale structural bench on the east side of the Sink Valley fault. Soils are characterized by clay and a high water table that is perched on top of the heavy clay soils. The high water table is at or within a foot of the soil surface during the wet period of the year. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is sedges and forbs.

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Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38*
20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A*
10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40*
3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Happyhollow family soils in map unit 7 is soil pedon 38. The surface is dark grayish brown (moist) silty clay 6 inches thick. The subsurface is a yellowish brown (moist) silty clay 6 inches thick. The calcic horizon begins at 12 inches below the surface and is a light yellowish brown (moist) to very pale brown (moist) silty clay. The calcic horizon continues to 48 inches or deeper. The water table was at 29 inches when the pit was described in March 2007. Mottles and gleyed soil were observed below 12 inches. Vegetation is grasses, sedges, widely scattered Wyoming big sagebrush, and wild rose.

The typifying soil pedon for Alamosa soils in map unit 7 is soil pedon 18A. The mollic surface is a very dark grayish brown (moist) loam to 7 inches. The cambic horizon is a brown (moist) loam to 15 inches deep. The calcic horizon is a light olive brown (moist) sandy loam to 30 inches. The underlying soil is grayish brown (moist) clay loam and sandy clay loam to 60 inches deep. Mottles were observed below 7 inches. The water table was at 51 inches when the described in September 2006.

Supporting Soil Pedons

Happyhollow family soil type was observed in pedon 45 within map unit 7 and a similar clayey soil in pedon 44. The Alamoss soil was also observed in pit 46.

Laboratory Analysis

The Happyhollow family soil is characterized by silty clay from the surface down to 24 inches or greater. Soil pH is 8.3 to 8.5 in the 12 to 24" horizon. Saturation percentage ranges from 69.9 to 81.8 in the upper 24 inches. The calcium carbonate equivalent ranges from 17.8 to 28.3 in the upper 20 inches and then increases to 44.5 below 20 inches. This soil pit was not sampled below 24 inches, because of the high water table.

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Alamosa soil is characterized by medium textured soils (loam, clay loam, and sandy clay loam) in the upper 60 inches. The calcium carbonate equivalent ranges increases from 20.2 percent in the upper 7 inches to 29.3 percent in the 30 to 45 inch horizon.

Soil Inclusions

A soil similar to Alamosa soils, but with more clay in the control section is in localized areas. Soil mottles were observed and water was flowing into pit 43 when it was described in April 2007. The water table appeared to be perched on top of the underlying clay horizon at 54 inches.

Tetonview family soils were identified in soil pit 40. Mottles were observed below 6 inches and a water table at 23 inches when the pit was described in March 2007. This soil has a dark surface (mollic) and a calcic horizon.

Dry soil profiles occur on small isolated mounds within map unit 7. These non-hydric soils include Brumley and Jonale family soils. Both are very deep soils with a calcic horizon. Jonale family soils have a dark surface (mollic).

8 Brumley – Graystone Cobbly - Snilloc complex, 3 to 8 percent slopes

General Description

These soils developed in very deep alluvium on the east side of the Coal Hollow project area. They are medium to coarse textured. Evidence of a fluctuating water table was observed in most soils below 48 to 60 inches, depending on location and physiographic setting. This map unit would be a good source of cover material, but most of the planned disturbance in this area will be limited to cover soil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22*
30	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20*
20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21*
10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	

* Lab analysis of typifying soil pedon for map unit.

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Typifying Soil Pedon Descriptions

Colors are for dry soil unless other wise noted.

The typifying soil pedon for the Brumley soils in map unit 8 is soil pedon 22. The surface is pale brown sandy loam to 6 inches. The argillic and upper calcic horizon is a light yellowish brown silty clay loam and sandy clay loam to 28 inches. The underlying soil is very pale brown sandy loam to 84 inches. Mottles increase significantly below 48 inches indicating that there is fluctuating water table during wet years. This soil supports Gamble oak, snowberry, grasses, and forbs.

The typifying soil pedon for the Graystone soil in map unit 8 is soil pedon 20. The surface is brown loam to 6 inches. The cambic horizon is light yellowish brown clay loam to 13 inches. The calcic horizon is very pale brown to light yellowish brown sandy loam and loamy sand to 54 inches. The underlying soil is a light yellowish brown loam to 72 inches and loamy sand to 96 inches. This soil supports Pinyon pine, Utah Juniper, Gamble oak, and snowberry.

The typifying soil pedon for Snilloc soils in map unit 8 is soil pedon 21. The surface is a light yellowish brown sandy clay loam to 8 inches. The calcic horizon is a pale brown sandy clay loam to 18 inches. The underlying soil is a pale brown strongly alkaline sandy loam to 96 inches. This soil was described in an opening of Wyoming big sagebrush within a larger area of Gamble oak.

Supporting Soil Pedons

A moist phase of the Brumley soil was observed in pit 47 in big sagebrush in map unit 8. A few faint mottles were observed below 24 inches. The amount of soil mottling increased significantly below 44 inches. This soil is on a low mound surrounded on three sides by wet soils in map unit 7. A water table was not observed when the pit was described in April 2007, but the mottles indicate that it is common for the water to rise within 44 inches of the surface in most years, and 24 inches in wet year.

Laboratory Analysis

The Brumley soil has calcium carbonate equivalents ranging from 17.5 to 23.8 percent.

The Graystone soil has a low saturation percentage in the 13 to 28 inch horizon (calcic). Calcium carbonate equivalents range from 16.5 to 25.4 percent. Available water capacity is 0.08 in layers of loamy sands below 28 inches.

The Snilloc family soil is characterized by strongly alkaline soil pH (8.7) below 36 inches. Calcium carbonate equivalents range from 16.8 to 29.8 percent.

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Soil Inclusions

The Jonale family soils occur within this map unit. These soils are similar to Brumley soils, but have a dark surface (mollic).

9 D Family - Deacon complex, 5 to 30 percent slopes

General Description

These clayey soils are very deep and dominated by clayey textures. They have a dark surface (mollic epipedon). The D family soil has an increase in lime at 6 to 12 inches below the surface, while the Deacon soil has similar levels of lime throughout the soil profile. Soils in this map unit appear to have developed from the large alluvial fan that covers most of Sink Valley. The map unit is delineated along Robinson Creek and in an area south of the creek that could be the remnants of a historic channel. Vegetation is dominantly big sagebrush, rabbitbrush, and grasses with pinyon pine and Utah juniper encroaching from adjacent areas.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41*
30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42*
10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5		Creek bottom	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for the D family soil in map unit 9 is soil pedon 41. The surface is brown sandy clay loam to 6 inches, dark brown (moist). The lower surface is brown clay to 12 inches, dark brown (moist). The subsurface (cambic) is pale brown silty clay to 36 inches, brown (moist). The subsoil (calcic) is very pale brown silty clay loam and sandy loam to 80 inches, yellowish brown (moist).

The typifying soil pedon for Deacon soils in map unit 9 is soil pedon 42. The surface is brown loam 9 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 24 inches, brown (moist). The upper subsoil (lower cambic) is pale brown sandy clay loam to 36 inches, brown (moist). The lower subsoil is light yellowish brown loam to 48 inches, yellowish brown (moist).

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Supporting Soil Pedons

Soil pedon 29 is representative of the D family soil in map unit 9.

Laboratory Analysis

Poor soil pH at depth and clayey horizons characterize soils in map unit 9. Soil pH is poor below 64 inches in the D family soil (pit 41) and below 36 inches in the Deacon soil. Horizons of silty clay and clay occur in the D family soil (pit 41) between 6 and 36 inches. The clayey horizon in the Deacon soil is between 9 and 24 inches.

Soil Inclusions

The channel area of Robinson Creek comprises a small portion of this map unit. The creek bottom is not vegetated.

10 Zigzag clay, 8 to 25 percent slopes

General Description

These clayey soils are shallow to Tropic shale and formed along the Sink Valley escarpment. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Zigzag	clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	50*
10	Drififty Family	loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthent	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the Zigzag soil in map unit 10 is soil pedon 50. The surface is light brownish gray clay to 4 inches, dark grayish brown (moist). The subsurface is light brownish gray clay to 19 inches, dark grayish brown and olive brown (moist). Tropic shale is at 19 inches.

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Laboratory Analysis

Clayey soil texture is the main limiting feature to the Zigzag soil in map unit 10. Lime percentage is between 18 and 19 throughout the soil profile. SAR is less than 1. Soil pH is in the good to fair range (8.1 to 8.4).

Soil Inclusions

The Drififty family soil occurs along ridges where the Tropic shale is interbeded with sandstone. These soils are loamy and less than 20 inches deep.
Calendar family soil occur in concave toeslope areas. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

11 A Family clay, 8 to 25 percent slopes

General Description

These soils are very deep and are on the footslope and backslope of the Sink Valley fault escarpment. Vegetation is grasses, rabbitbrush, and big sagebrush.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28*
10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
5	Zigzag	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the A family soil in map unit 11 is soil pedon 28. The surface is grayish brown clay to 8 inches, dark grayish brown (moist). The subsurface (cambic) is gray clay with moderate blocky structure to 24 inches, grayish brown (moist). The upper subsoil (calcic, Bwk) is gray clay with common fine soft calcium carbonate masses to 48 inches, grayish brown (moist). The lower subsoil (calcic, Bk) is light grayish brown clay with common fine and medium soft calcium carbonate masses to 102 inches, grayish brown (moist).

Laboratory Analysis

Clay texture is the primary limiting feature with the A family soil in map unit 11. SAR and conductivity increase significantly in the 24 to 48 inch horizon, but both

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are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

Inclusions of the Calendar family soil occur along shoulders of hills and ridges. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

Small inclusions of the Zigzag soil occur on the summits of ridges and hills. These soils are clayey and shallow (less than 20 inches) to Tropic shale.

12 Manzanst Taxadjunct Family clay, 3 to 12 percent slopes

General Description

These clayey soils are deep to very deep to Tropic shale and formed on gently sloping to moderately steep slopes along the west side of Sink Valley. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Manzanst taxadjunct, very deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	48*
10	Manzanst taxadjunct, deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	60
5	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Description

The typifying soil pedon for the Manzanst taxadjunct soil in map unit 10 is soil pedon 48. The surface is grayish brown clay (moist) 3 inches, very dark grayish brown (moist). The subsurface is light brownish gray clay to 30 inches, dark grayish brown (moist). The substratum is light brownish gray clay with 3 to 10 percent very fine and fine calcium carbonate masses to 84 inches, dark grayish brown (moist).

The typifying pedon for the Manzanst taxadjunct deep phase is pedon 60. It is similar to pedon 48. Tropic shale is at 48 inches.

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Laboratory Analysis

Clayey soil texture and SAR are the main limiting features of the Manzanst soil family in map unit 12. The SAR ranges from 10.80 to 12.70 below 12 inches.

Soil Inclusions

The A family soil occurs on the toeslopes and in swales where alluvium has accumulated. These soils are clayey and very deep (greater than 60 inches). They have an accumulation of carbonates in the subsoil.

13 A Family – Happyhollow Family complex, 1 to 5 percent slopes

General Description

These clayey soils are very deep to Tropic shale and formed on nearly level to gently sloping slopes in the south central portion of Sink Valley. Vegetation is grasses. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
80	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	59
15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for the A family soil in map unit 13 is soil pedon 59. The surface is light yellowish brown clay loam to 10 inches, dark grayish brown (moist). The subsurface is light yellowish brown and very pale brown clay loam to 45 inches, yellowish brown and pale brown (moist). The substratum is very pale brown and pale yellow sandy clay loam to 76 inches. Reddish yellow medium and coarse mottles were observed below 62 inches.

The typifying soil pedon for the Happyhollow family soil is soil pedon 45. The surface is light brownish gray loam to 12 inches, dark grayish brown (moist). The subsurface is light gray and very pale brown sandy clay loam to 48 inches, gray

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and light yellowish brown (moist). The substratum is very pale brown sandy clay loam to 84 inches, light yellowish brown (moist). The lower substratum is light gray silty clay to 100 inches, gray (moist). Yellow and brownish yellow medium and coarse mottles were observed below 5 inches.

Laboratory Analysis

Field conductivity (ECe) measurements for soil pit 59 ranged from 0.39 to 1.30 mmhos/cm.

Lab analysis of soil pit 28 is representative of the A family soil in map unit 13. Clay texture is the primary limiting feature with the A family soil in map unit 13. SAR and conductivity increase significantly in the 24 to 48 inch horizon (pedon 28), but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

The I family soils are similar to the A family soil, but they have aquic conditions below 20 inches. Reddish yellow fine mottles were observed in soil pedon 52 below 24 inches.

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Typifying Soil Profile Descriptions

The following soil profile descriptions are representative of the major named soils identified in the eleven soil map units for the Coal Hollow project area. Soil texture and pH are the results of laboratory analysis of samples collected from each horizon. Photographs of the soil profiles are in appendix E and photographs of the soil profile micromonolith boxes are in appendix F.

Soils were correlated to established soils series when possible (NRCS 2007). Soils that are within the range of characteristics of and established series are listed as soils (e.g. Graystone soils). The soils that are not completely within the range of characteristics for a similar established series within the same taxonomic family are listed as family soils (e.g. Calendar family soils). The state of origin for each soil series is listed in parenthesis. When no established series were listed for a soil family, then a single capital letter was used in place of a series name (e.g. A Family Soils).

Typifying pedon descriptions are provided for major soil types.

A Family Soils

The A family soil occurs as major named component in map units 1 and 11. It also occurs as a minor component in map units 3, 4, and 9. This soil is very deep (greater than 60 inches). There are no established soil series in this soil family (NRCS 2007).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Calciustepts

Soil pit 1 is representative of the A family soils that occur within the Coal Hollow project area. It is located in map unit 1. It formed in alluvium deposited by a large alluvial fan over Tropic shale residuum. Slope is 3 percent on a west slope (280°) on a concave fanslope. Vegetation is big sagebrush, grasses and forbs. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium platy parting to fine granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; strong effervescence, neutral (pH 7.3); clear smooth boundary.

Bk1 – 6 to 12 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/3) moist; moderate medium and coarse angular blocky structure; hard, very firm, very sticky, and very plastic; common very fine, few fine, medium, and coarse roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); gradual wavy boundary.

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Bk2 – 12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/3) moist; strong medium and coarse prismatic structure; very hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, strongly alkaline (pH 8.5); gradual smooth boundary.

Bk3 – 24 to 42 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/3) moist; strong medium and coarse prismatic parting to strong angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, strongly alkaline (pH 8.7); clear wavy boundary.

C – 42 to 60 inches; light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; strong effervescence, moderately alkaline (pH 8.4); clear wavy boundary.

Alamosa Soils

The Alamosa soil occurs as a major named component in map units 7 and 11. This soil is very deep (greater than 60 inches). Alamosa soils mapped in the Coal Hollow Project Area are within the range of characteristics listed in the official description (Colorado) of the Alamosa series (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, frigid Typic Argiaquolls

Soil pit 18A is representative of the Almosa soils that occur within the Coal Hollow project area. It is located in map unit 7 in a wet meadow east of the Sink Valley fault escarpment. It formed in formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 4 percent on a west southwest slope (250°). Water table was at 51 inches on September 14, 2006. Vegetation is sedges, grasses, and iris. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 7 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky parting to medium granular structure; soft, friable, slightly sticky, and slightly plastic; many very fine, fine and medium roots; many very fine interstitial pores; slight effervescence, slightly alkaline (pH 7.7); abrupt smooth boundary

Bw – 7 to 15 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; common faint mottles; moderate fine and medium subangular blocky structure; soft, friable, slightly sticky, and slightly plastic; few very fine and common fine and medium roots; few fine and common medium interstitial pores; moderate effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

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Bk – 15 to 30 inches; pale yellow (2.5Y 7/3) sandy loam, grayish brown (2.5Y 5/3) moist; common faint mottles; moderate fine and medium subangular structure; slightly hard, friable, slightly sticky, and non-plastic; common medium and few very fine and fine roots; few very fine tubular pores; 30 percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.1); abrupt smooth boundary.

2Btk – 30 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many prominent mottles; moderate fine subangular structure; slightly hard, firm, slightly sticky, and slightly plastic; common medium and few very fine and fine roots; few very fine tubular pores; 35 percent clay films on ped faces; strong effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

2Cg – 45 to 60 inches; light olive brown (5Y 6/2) sandy clay loam, olive gray (5Y 5/2) moist; massive; few fine and medium roots; few fine tubular pores; violent effervescence, moderately alkaline (pH 8.0).

Brumley Soils

The Brumley soils occur as a major named component in map unit 8. It also occurs as a minor component in map unit 7. This soil is very deep (greater than 60 inches). Brumley soils mapped in the Coal Hollow Project Area are within the range of characteristics contained in the official description of the Brumley series (Colorado). The official Brumley description does not contain an Oe or Oi horizon of oak leaves and decomposing litter (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Calcidic Haplustalfs

Soil pit 22 is representative of the Brumley soils that occur within the Coal Hollow project area. It is located in map unit 8 on a convex hillslope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 8 percent on a southwest slope (220°). Vegetation is Gamble oak, snowberry, and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. The field description for pit 22 describes some soil mottles, but the box sample does not show any signs of redox mottles; and two supporting soil pits (47 and 51) do not contain any mottles.

Oe – 7 to 4 inches; oak leaves, duff and twigs.

Oi – 4 to 0 inches; partially decomposing oak leaf litter.

A – 0 to 6 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, non sticky, and non plastic; common very fine, fine and

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medium roots; few very fine and few fine interstitial pores; slight effervescence, slightly alkaline (pH 7.7); abrupt smooth boundary.

Btk1 – 6 to 15 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky, and plastic; few very thin clay films on ped faces; common fine and medium and few very fine and coarse roots; few very fine and fine tubular pores; slight effervescence, slightly alkaline (pH 7.7); clear smooth boundary.

Btk2 – 15 to 28 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, and slightly plastic; common thin clay films on ped faces; few fine, medium and coarse roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bk1 – 28 to 48 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; few prominent mottles; strong medium and coarse subangular blocky structure; hard, firm, non sticky, and non plastic; few fine, medium and coarse roots; few very fine and fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

Bk2 – 48 to 60 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; common prominent mottles; massive; slightly hard, friable, non sticky, and non plastic; few fine, medium and coarse roots; common very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

C – 60 to 84 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; many prominent mottles; massive; slightly hard, friable, non sticky, and non plastic; few very fine, fine, medium and coarse roots; many very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.2).

Calendar Family Soils

The Calendar soil family occurs as a major named component in map units 2 and 5. It also occurs as a minor component in map units 3, 10, and 11. This soil is moderately deep (20 to 40 inches) to Tropic shale. The official description for the Calendar series (New Mexico) has 10YR colors in the A horizon and has a Bk horizon above the shale (NRCS 2007).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Haplustepts

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Soil pit 24 is representative of the Calendar soil family that occurs within the Coal Hollow project area. It is located in map unit 5. It formed in Tropic shale residuum on a convex hillslope. Slope is 13 percent on a north northeast slope (20°). Vegetation is pinyon pine and Utah juniper with scattered big sagebrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 5 inches; dark grayish brown (2.5Y 4/3) clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky parting to medium granular structure; soft, very friable, sticky, and very plastic; common very fine, few fine, medium, and coarse roots; common very fine and few fine interstitial pores; no effervescence, slightly alkaline (pH 7.6); clear wavy boundary.

Bw1 – 5 to 17 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/3) moist; moderate fine and medium subangular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; no effervescence, slightly alkaline (pH 7.7); clear wavy boundary.

Bw2 – 17 to 32 inches; light olive gray (5Y 6/2) clay, olive (5Y 5/3) moist; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; no effervescence, slightly alkaline (pH 8.1); abrupt wavy boundary.

Cr – 32 inches; decomposing Tropic shale and sandstone.

Cibeque Family Soils

The Cibeque soil family occurs as a major named component in map unit 3. This soil is very deep (greater than 60 inches). The official description for Cibeque series (Arizona) has a warmer annual temperature (about 53° F) and longer frost free period (120 to 170 days) than the Alton, Utah area (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Calciustepts

Soil pit 6 is representative of the Cibeque soil family that occurs within the Coal Hollow project area. It is located in map unit 3 It formed in alluvium over Tropic shale. Slope is 3 percent on a west northwest slope (290°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A1 – 0 to 6 inches; brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; weak medium granular structure; loose, loose, non sticky, and non plastic; common very fine, few fine, common medium and few coarse roots; many very fine interstitial pores; strong effervescence, moderately alkaline (pH 8.1); clear wavy boundary.

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A2 – 6 to 12 inches; yellowish brown (10YR 5/4) loamy sand, dark grayish brown (10YR 4/2) moist; weak medium subangular structure; soft, very friable, non sticky, and non plastic; common very fine and fine and few medium roots; many very fine interstitial pores; strong effervescence, moderately alkaline (pH 8.3); clear smooth boundary.

Bk1 – 12 to 24 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate fine and medium subangular structure; slightly hard, firm, slightly sticky, and non plastic; common very fine and few fine roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

Bk2 – 24 to 34 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; strong medium and coarse subangular structure; hard, very firm, non sticky, and non plastic; few very fine roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); gradual smooth boundary.

2C – 34 to 60 inches; light brownish gray (10YR 6/2) silty clay, brown (10YR 4/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.3).

Cookcan Soils

The Cookcan soil occurs as a major named component in map unit 6. This soil is greater than 40 inches deep. The official description for Cookcan series does not contain a cambic (Bwg) horizon (Idaho), but is otherwise similar to the soil mapped in the Coal Hollow Project Area (NRCS 2007).

Taxonomic classification: coarse-loamy, mixed, superactive, frigid Typic Calciaquolls

Soil pit 9B is representative of the Cookcan soils that occur within the Coal Hollow project area. It is located in map unit 6 in a small alluvial basin. It formed in alluvium from Tropic shale and mixed sediments. Slope is 1 percent on a south slope (190°). Vegetation is grasses, big sagebrush, and rabbitbrush. Water table was at 57 inches when pit was described on September 12, 2006. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. No laboratory analysis was completed on the 2C horizon.

A1 – 0 to 6 inches; dark grayish brown (2.5Y 4/2) loam, very dark gray (2.5Y 3/0) moist; weak medium granular structure; soft, friable, slightly sticky, and slightly plastic; many coarse, common very fine, fine, and few medium roots; many very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

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Bwg – 6 to 14 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse granular structure; slightly hard, firm, slightly sticky, and slightly plastic; many medium, common very fine and fine roots; common very fine tubular pores; slight effervescence, moderately alkaline (pH 8.2); abrupt smooth boundary.

Bkg – 14 to 28 inches; light grayish brown (2.5Y 6/2) sandy loam, dark gray (2.5Y 4/0) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, and slightly plastic; common very fine, fine, and medium roots; common very fine tubular pores; strong effervescence, strongly alkaline (pH 8.5); abrupt smooth boundary.

Bk – 28 to 48 inches; light gray (2.5Y 7/2) sandy loam, light olive brown (2.5Y 5/4) moist; soil to wet to identify structure structure; hard, firm, slightly sticky, and slightly plastic; few fine, and medium roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); abrupt smooth boundary.

C – 48 to 57 inches; water table at 57 inches, few very fine roots, no effervescence.

D Family Soils

The D family soil occurs as a major named component in map units 2 and 9. It also occurs as a minor component in map units 1 and 4. This soil is very deep (greater than 60 inches). There are no established soil series in this soil family (NRCS 2007).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Calciustolls

Soil pit 2 is representative of the D family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 2. It formed in colluvial landslide deposit over Tropic shale. Slope is 6 percent on a south southwest slope (200°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A1 – 0 to 7 inches; brown (10YR 5/3) clay loam, dark yellowish brown (10YR 3/2) moist; moderate medium and coarse platy parting to fine granular structure; soft, very friable, sticky, and plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and common fine tubular pores; strong effervescence, slightly alkaline (pH 7.6); clear smooth boundary.

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A2 – 7 to 12 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky, and very plastic; common very fine, fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; strong effervescence, slightly alkaline (pH 7.7); clear wavy boundary.

Bwk1 – 12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/3) moist; strong medium and coarse prismatic parting fine and medium angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, slightly alkaline (pH 7.8); gradual wavy boundary.

Bwk2 – 24 to 48 inches; light brownish gray (2.5Y 6/3) clay, dark grayish brown (2.5Y 4/3) moist; strong medium and coarse angular blocky structure; extremely hard, extremely firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, slightly alkaline (pH 8.0); gradual irregular boundary.

Bk – 48 to 72 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; few very fine tubular pores; moderate effervescence, slightly alkaline (pH 7.8); gradual wavy boundary.

C – 72 to 96 inches; light gray (2.5Y 7/3) clay, grayish brown (2.5Y 5/3) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; moderate effervescence, slightly alkaline (pH 7.8).

Deacon Soils

The Deacon soils occur as a major named component in map unit 9. This soil is deep (greater than 40 inches) to very deep. Soils mapped in the Coal Hollow Project Area have have characteristics that are within the range of characteristics described in the official description (New Mexico) for the Deacon series (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Haplustolls

Soil pit 42 is representative of the Deacon soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 9 adjacent to Robinson Creek. It formed in alluvium derived from Tropic shale and deposited by a large alluvial fan. Slope is 7 percent. Vegetation is Utah juniper, sagebrush, rabbitbrush, and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. Soils were not described below 48 inches in this pit.

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A — 0 to 9 inches; brown (10YR 5/3) cobbly loam, very dark grayish brown (10YR 3.2) moist; moderate fine granular structure; soft, very friable, non-sticky, and non-plastic; common very fine and fine and few medium roots; 10 percent gravels and 5 percent cobbles; moderate effervescence, moderately alkaline (pH 7.9); clear smooth boundary.

Bw — 9 to 24 inches; pale brown (10YR6/3) cobbly silty clay, dark brown (10YR 4/3) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine, fine, and medium roots; 10 percent gravels and 5 percent cobbles; strong effervescence, moderately alkaline (pH 8.1); gradual wavy boundary.

Bwk – 24 to 36 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, and slightly plastic; few fine and medium roots; 5 percent gravels and 3 percent cobbles; strong effervescence, moderately alkaline (pH 8.3); clear wavy boundary.

Bk – 36 to 48 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky, and non-plastic; few very fine and fine roots; trace of gravels and cobbles; strong effervescence, strongly alkaline (pH 8.6).

Drififtу Family Soils

The Drififtу family soil occurs as a major named component in map unit 5. It also occurs as a minor component in map unit 10. This soil is shallow (less than 20 inches) to sandstone and shale. The official series description for Drififtу series (Utah) has a clay content in the particle-size control section that is coarser (10 to 18 percent clay) than in the soils found in the Coal Hollow Project Area (18 to 30 percent clay). The average annual precipitation is also slightly lower 12 to 14 inches) than in the Alton, Area (NRCS 2007).

Taxonomic classification: loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthents

Soil pit 49 is representative of the Drififtу family soils that occur within the Coal Hollow project area. It is located in map unit 5 in the northern portion of the Coal Hollow project area. It formed in interbeded sandstone and shale. Slope is 16 percent on a south slope (180°). Vegetation is pinyon pine, Utah juniper, black sagebrush, and Indian ricegrass. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 3 inches; light yellowish brown (2.5Y 6/4) gravelly silty clay loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular parting to moderate fine granular structure; slightly hard, very friable, slightly sticky,

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and slightly plastic; common very fine and few fine, medium and coarse roots; common very fine interstitial and tubular pores; 30 percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

C – 3 to 10 inches; light olive brown (2.5Y 5/4) gravelly loam, olive brown (2.5Y 45/4) moist; massive; slightly hard, very friable, slightly sticky, and slightly plastic; common very fine and few fine, medium and coarse roots; few very fine tubular pores; 25 percent angular sandstone gravels; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

R – 10 inches; sandstone interbeded with shale.

Graystone Soils

The Graystone soils occur as a major named component in map unit 6. This soil is very deep (greater than 60 inches). The official description for Graystone series (Wyoming) does not contain a cambic (Bwk) horizon or an organic (Oe) horizon, but is otherwise similar to the soil mapped in the Coal Hollow Project Area (NRCS 2007).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustolls

Soil pit 15 is representative of the Graystone soils that occur within the Coal Hollow project area. It is located in map unit 6 in a small alluvial basin. It formed in alluvium from Tropic shale and mixed sediments. Slope is 2 percent on a west slope (260°). Vegetation is grasses, sedges, and black sagebrush. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

Oe – 1-0 inches; dense root mat; abrupt smooth boundary.

A – 0 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium and coarse granular structure; soft, friable, slightly sticky, and non plastic; many very fine, fine, and medium and common coarse roots; common very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.0); abrupt smooth boundary.

Bwk – 8 to 20 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky, and plastic; common very fine and fine, and few medium roots; many very fine and few medium and coarse tubular pores; strong effervescence, strongly alkaline (pH 8.5); abrupt wavy boundary.

Bk1 – 20 to 37 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; strong medium and coarse subangular blocky structure; very hard, very firm, sticky, and plastic; common very fine and few fine and medium

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roots; few very fine and fine tubular pores; strong effervescence, 4 percent very fine soft calcium carbonate masses, strongly alkaline (pH 8.7); abrupt smooth boundary.

Bk2 – 37 to 58 inches; very pale brown (10YR 7/3) loam, yellowish brown (10YR 5/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, 8 percent very fine and fine soft calcium carbonate masses, strongly alkaline (pH 8.6); abrupt wavy boundary.

C1 – 58 to 73 inches; pale brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; common prominent yellowish brown mottles (10YR 5/8, moist); massive; soft, very friable, non sticky, and non plastic; few very fine and fine roots; violent effervescence, moderately alkaline (pH 8.4); abrupt smooth boundary.

C2 – 73 to 96 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; common prominent yellowish brown mottles (10YR 5/8, moist); massive; soft, very friable, non sticky, and non plastic; few very fine and fine roots; violent effervescence, moderately alkaline (pH 8.3).

Graystone Cobbly Substratum Family Soils

The Graystone cobbly substratum soil family occurs as a major named component in map units 4 and 8. This soil is very deep (greater than 60 inches) and is cobbly to very cobbly below 24 inches. The official description for Graystone series (Wyoming) does not contain coarse fragments in the substratum (NRCS 2007).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustolls

Soil pit 39 is representative of the Graystone cobbly substratum family soils that occur within the Coal Hollow project area. It is located in map unit 4 on a fan terrace slope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 3 to 8 percent on a west slope. The area has been cultivated and planted to upland grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. No laboratory analysis was completed on 2C horizon.

Ap – 0 to 6 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, friable, slightly sticky, and slightly plastic; common very fine and fine and few medium roots; no effervescence, slightly alkaline (pH 7.8); clear wavy boundary.

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A2 – 6 to 12 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky parting to medium granular structure; soft, friable, slightly sticky, and slightly plastic; few very fine, common fine and few medium roots; very slight effervescence, slightly alkaline (pH 7.8); clear smooth boundary.

Bk1 – 12 to 24 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; few very fine roots; strong effervescence, 8 percent soft fine calcium carbonate masses, moderately alkaline (pH 8.0); gradual wavy boundary.

Bk2 – 24 to 36 inches; very pale brown (10YR 7/3) cobbly sandy loam, yellowish brown (10YR 5/4) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; 10 percent gravel and 5 percent cobble; few very fine roots; strong effervescence, 10 percent soft fine calcium carbonate masses, moderately alkaline (pH 7.9); gradual wavy boundary.

2C – 36 to 75 inches; very pale brown (10YR 7/3) very cobbly loamy sandy, brown (10YR 5/3) moist; strong medium and coarse angular blocky structure; very hard, very firm, non sticky, and non plastic; 15 percent gravel and 30 percent cobble; few very fine roots; strong effervescence, 15 percent soft fine calcium carbonate masses, 1 mm thick calcium carbonate concretions on bottom of rock fragments, moderately alkaline (pH 7.9); gradual wavy boundary.

Happyhollow Family Soils

The Happyhollow soil occurs as a major named component in map units 7. This soil is deep to very deep (40 inches to greater than 60 inches). Precipitation range in the official description of the Happyhollow series (Wisconsin) is much higher (28 to 33 inches) than in the Alton, Utah area. No other soil series are listed within this soil family (NRCS 2007).

Taxonomic classification: fine, mixed, superactive frigid Aeric Epiaquepts

Soil pit 38 is representative of the Happyhollow family soils that occur within the Coal Hollow project area. It is located in map unit 7 in a wet meadow east of the Sink Valley fault escarpment. It formed in formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 2 percent on a south slope (190°). Water table was at 29 inches on March 7, 2007. Vegetation is sedges, grasses, sagebrush and wild rose. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH. Soil profile was too wet to sample or describe below 40 inches.

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A – 0 to 6 inches; light brownish gray (10YR 6/2) silty clay, very dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; slighty hard, friable, sticky, and plastic; many very fine, fine and common medium roots; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

AB – 6 to 12 inches; very pale brown (10YR 7/3) silty clay, yellowish brown (10YR 5/4) moist; strong fine and medium prismatic structure; hard, firm, sticky, and plastic; many very fine, fine and common medium roots; strong effervescence, 3 percent fine soft calcium carbonate masses, moderately alkaline (pH 8.3); abrupt smooth boundary.

Bk – 12 to 20 inches; light gray (10YR 7/2) silty clay, light yellowish brown (10YR 6/4) moist; 35 percent gleyed; massive; hard, firm, sticky, and plastic; violent effervescence, 25 percent fine and medium soft calcium carbonate masses, strongly alkaline (pH 8.5); abrupt smooth boundary.

Bk2 – 20 to 40 inches; white (10YR 8/1) silty clay, light gray (10YR 7/2) moist; gleyed colors; massive; hard, firm, sticky, and plastic; violent effervescence, 40 percent medium soft calcium carbonate masses, strongly alkaline (field pH 8.7).

I Family Soils

The I family soil is a minor component in map unit 6. This soil is very deep (greater than 60 inches). There are no established soil series in this soil family (NRCS 2007).

Taxonomic classification: fine-loamy, mixed superactive, frigid Aquic Calciustepts

Jicarilla Family Soils

The Jicarilla family soil (New Mexico) is a minor component in map unit 7. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, frigid Typic Argiaquolls

Jonale Family Soils

The Jonale soil family occurs as a major named component in map units 4 and 6. It also occurs as a minor component in map units 7 and 8. This soil is very deep (greater than 60 inches). The official description for Jonale series (New Mexico) has a warmer annual temperature (about 54° F) and longer frost free period (150 to 180 days) than the Alton, Utah area (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Aridic Calciustolls

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Soil pit 17 is representative of the Jonale family soils that occur within the Coal Hollow project area. It is located in map unit 4. It formed in alluvium and colluvium on an alluvial fan slope. Slope is 3 percent on a southwest slope (210°). Vegetation is big sagebrush, rabbitbrush and grasses with scattered pinyon pine and juniper. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse platy parting to fine granular structure; soft, friable, sticky, and plastic; many very fine, common fine and medium, and few coarse roots; common very fine interstitial and few fine tubular pores; 1 percent gravels; slight effervescence, slightly alkaline (pH 7.8); clear smooth boundary.

Bw -- 9 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; common very fine, few fine and medium, and coarse roots; few very fine and fine tubular pores; 2 percent gravels; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bwk1 – 18 to 30 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 4/3) moist; strong fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; few very fine, fine, and medium roots; few very fine and fine tubular pores; 2 percent gravels; strong effervescence, moderately alkaline (pH 8.0); clear wavy boundary.

Bwk2 – 30 to 45 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; strong fine and medium angular blocky structure; very hard, very firm, sticky, and plastic; few very fine and fine roots; few fine and medium tubular pores; 2 percent gravels; strong effervescence, 4 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.1); gradual wavy boundary.

Bk1 – 45 to 60 inches; very pale brown (10YR 7/3) clay loam, yellowish brown (10YR 5/4) moist; strong medium and coarse subangular blocky structure; slightly hard, firm, sticky, and plastic; few very fine roots; few fine and medium tubular pores; 2 percent gravels; strong effervescence, 8 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.2); gradual wavy boundary.

Bk2 – 60 to 80 inches; very pale brown (10YR 7/4) silty clay, yellowish brown (10YR 5/4) moist; massive; extremely hard, extremely firm, very sticky, and very plastic; common very fine and few fine tubular pores; strong effervescence, 6 percent very fine and fine soft calcium carbonate masses, moderately alkaline (pH 8.0).

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M Family Soils

The M family soil occurs as major named component in map units 2 and 5. It also occurs as a minor component in map units 1, 4, and 9. This soil is moderately deep (20 to 40 inches) to Tropic shale. It is the moderately deep phase of the A Family Soil. There are no established soil series in this soil family (NRCS 2007).

Taxonomic classification: fine, mixed, superactive, mesic Aridic Haplustepts

Soil pit 3 is representative of the M family soils that occur within the year one portion of the Coal Hollow project area. It is located in map unit 2 on a convex hillslope. It formed in formed in Tropic shale residuum. Slope is 9 percent on a south southeast slope (160°). Vegetation is big sagebrush, rabbitbrush and grasses. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 4 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium and coarse platy parting to moderate fine granular structure; soft, very friable, slightly sticky, and slightly plastic; common very fine and few fine and medium roots; common very fine and few fine tubular pores; slight effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

Bw – 4 to 13 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; strong medium and coarse prismatic parting to strong medium angular blocky structure; slightly hard, firm, sticky, and plastic; common very fine and few fine and medium roots; common very fine interstitial and few fine tubular pores; strong effervescence, moderately alkaline (pH 8.3); clear wavy boundary.

Bwk – 13 to 20 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/3) moist; strong medium and coarse prismatic parting to strong medium angular blocky structure; very hard, very firm, very sticky, and very plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.1); gradual wavy boundary.

Bk – 19 to 33 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/3) moist; strong medium and coarse angular blocky structure; very hard, very firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.4); gradual wavy boundary.

Cr – 33 inches; decomposing Tropic shale.

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Manzanst Taxadjunct Family Soils

The Manzanst family soil (Colorado) is the dominant soil component in map unit 12 and a minor component in map unit 1. This soil is very deep (greater than 60 inches). The official description for Manzanst series (Colorado) has a warmer annual temperature (about 50° F) and longer frost free period (135 to 155 days) than the Alton, Utah area (NRCS 2007). Soils in the Coal Hollow project area area a taxadjunct to the official series classification since they have clay percentages in the control section of 60 percent and higher.

Taxonomic classification: fine, smectitic, superactive, mesic Aridic Haplustalfs

Soil pit 48 is representative of the Manzanst soil family that occurs within the Coal Hollow project area. It is located in map unit 12 at the south end of the project area on a linear east northeast facing slope of 4 to 5 percent. It developed Tropic shale residuum. Mottles that occur below 30 inches may be the result of water perching on the underlying dense clay horizons. This profile was difficult to dig with a large excavator.

A – 0 to 3 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky parting to moderate medium granular structure; hard, friable, moderately sticky, and moderately plastic; common very fine, fine and medium roots; common very fine and fine tubular pores; slight effervescence, slightly alkaline (pH 7.7); clear smooth boundary.

Bt1 – 3 to 12 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/24) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; very hard, firm, sticky, and plastic; common very fine, fine and few medium roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bt2 – 12 to 30 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/24) moist; strong medium and coarse prismatic parting to moderate medium subangular blocky structure; very hard, firm, sticky, and plastic; few very fine and fine roots; slight effervescence, moderately alkaline (pH 8.2); clear smooth boundary.

Bt3 – 30 to 48 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/24) moist; strong medium prismatic parting to moderate medium subangular blocky structure; extremely hard, very firm, very sticky, and very plastic; 16 percent strong brown (7.5YR 5/6) fine and medium mottles; moderate effervescence, 3 percent very fine and fine soft lime masses, moderately alkaline (pH 8.1); gradual smooth boundary.

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Bt3 – 48 to 84 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/24) moist; strong medium prismatic parting to strong medium subangular blocky structure; extremely hard, extremly firm, very sticky, and very plastic; 7 percent reddish yellow (7.5YR 6/6) fine mottles; moderate to strong effervescence, 10 percent fine soft lime masses, 2 percent fine gypsum masses, moderately alkaline (pH 8.1); gradual smooth boundary.

N Family Soils

The N soil family occurs to a very limited extent in map unit 1. The soil is similar to the D family soil, but aquic soil conditions were identified. This soil is very deep (greater than 60 inches).

Taxonomic classification: fine, mixed, superactive, frigid Aquic Calciustolls

Snilloc Soils

The Snilloc soils occur as a major named component in map unit 8. This soil is very deep (greater than 60 inches). Snilloc soils mapped in the Coal Hollow Project Area are within the range of characteristics contained in the official description (Wyoming) of the Snilloc series (NRCS 2007).

Taxonomic classification: coarse-loamy, mixed, superactive, mesic Aridic Calciustepts

Soil pit 21 is representative of the Snilloc soils that occur within the Coal Hollow project area. It is located in map unit 8 on a convex hillslope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 2 percent on a south southwest slope (190°). Vegetation is big sagebrush and grasses surrounded by Gamble oak. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 8 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate medium and coarse subangular blocky structure; soft, very friable, non sticky, and non plastic; many very fine, common fine and medium, few coarse roots; common very fine and fine interstitial pores; very slight effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

Bwk1 – 8 to 18 inches; light brown (7.5YR 6/3) sandy clay loam, brown (7.5YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm, sticky, and slightly plastic; few very fine, common very fine and few fine and medium roots; few very fine, fine, and medium tubular pores; strong effervescence, moderately alkaline (pH 8.1); clear wavy boundary.

Bwk2 – 18 to 36 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard,

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firm, slightly sticky, and slightly plastic; common very fine and few fine and medium roots; few very fine tubular pores; slight effervescence, moderately alkaline (pH 8.4); clear wavy boundary.

Bk – 36 to 50 inches; light brown (7.5YR 6/3) sandy loam, brown (7.5YR 5/4) moist; strong medium and coarse subangular blocky structure; slightly hard, very friable, non sticky, and non plastic; few very fine roots; few very fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

2C1 – 50 to 62 inches; pale brown (10YR 6/3) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, non sticky, and non plastic; few very fine and fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

2C2 – 62 to 96 inches; very pale brown (10YR 7/3) sandy loam, yellowish brown (10YR 5/4) moist; single grain; loose, loose, non sticky, and non plastic; many very fine and few fine tubular pores; slight effervescence, strongly alkaline (pH 8.7); clear smooth boundary.

Tetonview Family Soils

The Tetonview family soil (Montana) is a minor component in map unit 7. This soil is deep (greater than 40 inches).

Taxonomic classification: fine-loamy, mixed, superactive frigid Aeric Calciaquolls

V Family Soils

The V family soil was correlated to the O family during preparation of the soil survey report.

Wapiti Family Soils

The Wapiti soil family occurs as a major named component in map units 1, 3 and 4. This soil is very deep (greater than 60 inches). The official description of Wapiti series (Colorado) is similar to the soil mapped in the Coal Hollow project area, but has a warmer annual temperature (51°F) and a longer growing season (125 to 155 days) than the Alton, Utah area (NRCS 2007).

Taxonomic classification: fine-loamy, mixed, superactive, mesic Calcidic Argiustolls

Soil pit 19 is representative of the Wapiti soil family that occurs within the Coal Hollow project area. It is located in map unit 4 on a convex fan terrace slope. It formed in alluvium from Tropic shale deposited by a large alluvial fan. Slope is 5 percent on a south west slope (260°). Vegetation is big sagebrush, rabbitbrush,

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grasses and scattered Utah juniper. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 6 inches; grayish brown (10YR 5/2) loam, brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, few fine, medium, and coarse roots; many very fine interstitial pores; slight effervescence, moderately alkaline (pH 8.0); clear smooth boundary.

Bt – 6 to 12 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, very firm, slightly sticky, and slightly plastic; few thin clay films in pores; few very fine and fine roots; few very fine and fine tubular pores; slight effervescence, moderately alkaline (pH 8.2); clear wavy boundary.

Btk1 – 12 to 24 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; very hard, very firm, sticky, and plastic; common medium clay films on ped faces and few thin clay films in pores; few very fine and fine roots; few very fine and fine tubular pores; strong effervescence, 4 percent very fine soft calcium carbonate masses, moderately alkaline (pH 8.2); clear wavy boundary.

Btk2 – 24 to 37 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, very firm, sticky, and plastic; few thin clay films on ped faces and in pores; few fine roots; few very fine and fine tubular pores; strong effervescence, 8 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.5); clear wavy boundary.

Bk1 – 37 to 51 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; strong fine and medium subangular blocky structure; hard, very firm, slightly sticky, and non plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, 4 percent fine soft calcium carbonate masses, moderately alkaline (pH 8.4); clear smooth boundary.

Bk2 – 51 to 68 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, non sticky, and non plastic; few very fine and fine roots; common very fine and few fine tubular pores; violent effervescence, 6 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.5); clear wavy boundary.

Bk3 – 68 to 90 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; loose, loose, non sticky, and non plastic; many very fine interstitial pores; strong effervescence, 6 percent fine soft calcium carbonate masses, strongly alkaline (pH 8.7).

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Zigzag Soils

The Zigzag soils occur as a major named component in map unit 10. It also occurs as a minor component in map units 5 and 11. This soil is shallow (less than 20 inches) to Tropic shale. Soils mapped as Zigzag in the Coal Hollow Project Area have characteristics within the range described in the official series description (Colorado) for Zigzag soils (NRCS 2007).

Taxonomic classification: Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthents

Soil pit 50 is representative of the Zigzag soils that occur within the Coal Hollow project area. It is located in map unit 10 on the Sink Valley fault escarpment. It formed in Tropic shale residuum. Slope is 16 percent on a west northwest slope (292°). Vegetation is Utah juniper, black sagebrush, and Indian ricegrass. Soil colors are for dry soil unless specified otherwise. Soil pH values are laboratory pH.

A – 0 to 4 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular structure; slightly hard, very friable, sticky, and plastic; common very fine and few fine and medium roots; common very fine interstitial and tubular pores; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

C1 – 4 to 11 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky, and plastic; common very fine and few fine and medium roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.1); clear smooth boundary.

C2 – 11 to 19 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky, and plastic; few very fine and fine roots; few very fine tubular pores; strong effervescence, moderately alkaline (pH 8.4); clear smooth boundary.

Cr – 19 inches; decomposing Tropic shale.

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Soil Limiting Features

Topsoil and subsoil salvage depths were determined by the depth to carbonates, soil pH (less than 8.5), salinity (EC less than 4.0), sodicity (SAR less than 4), texture and depth to parent material. Clayey soils, carbonate accumulations and corresponding poor pH are the primary limiting soil features in the Coal Hollow project area. The depth to each of these limiting soil features varies by soil type and map unit.

The determination of good, fair, poor, or unsuitable qualities of the topsoil and subsoil is based on the soil suitability criteria established by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (Utah DOGM, 2005). The Utah DOGM suitability guidelines are summarized in table 4-1.

Table 4-1. Soil suitability and unsuitability criteria (Utah DOGM, 2005).

Criteria	Good	Fair	Poor	Unacceptable
Saturation %	25 to 55	≥56 to 80	<25 or >80	
pH	6.5 to 8.2	6.0 to 6.4 8.2 to 8.5	5.5 to 6.0 8.6 to 9.0	<5.5 >9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	>15
SAR	0 to 4	5 to 10	10 to 14	>14
$CaCO_3$ %	<15	15 to 30	>30	
Texture	sl, l, sil, scl, vfsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			≤10%
Available Water Capacity	>0.10 moderate	0.05 to 0.10 low	<0.05 very low	
K factor	<0.37	0.37	>0.37	

Topsoil and Subsoil Salvage Depths

Table 4-2 identifies the depth of topsoil, subsoil, and clayey subsoil that may be available for salvage based on field evaluations of soil pits and laboratory analysis of soil samples. Salvage depths may include some poor quality materials when the weighted average of mixed soil is still within the fair range. Field data sheets are in appendix B. Results of the laboratory analysis of soil samples are contained in appendix C.

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Soils with less than good EC and SAR qualities were not included in the salvage depths.

Clayey subsoil (clay and silty clay) is common in the Coal Hollow project area. It is of lesser quality relative to the other subsoil, but will be needed to achieve an adequate reclamation soil profile depth.

Actual topsoil and subsoil salvage depths will be closely monitored by Alton Coal Development staff in consultation with a certified professional soil scientist to ensure that unsuitable materials are not incorporated into the topsoil and subsoil stockpiles or placed directly into the reclamation soil profile.

Table 4-2. Topsoil and subsoil salvage depths by map unit in disturbance area.

Map Unit	Percent of Map Unit	Soil Types	Topsoil Depth	Good/ Fair Subsoil Depth	Poor Subsoil Depth	Average Total Salvage Depth
	%		inches	Inches	Inches	Inches
1		**A Family – Wapiti Family complex, 3 to 8 percent slopes**				
	65	A Family	9	17	64	
	15	Wapiti Family	7	57	21	
	10	D Family	11	16	59	
	5	Manzanst Family	6	24	0	
	5	N Family	8	12	85	
		Average salvage depths[1]	9	23	55	87
2		**M family – Calendar Family - D Family complex, 3 to 8 percent slopes**				
	60	M Family	7	14	9	
	25	Calendar Family	5	23	14	
	15	D Family	11	16	59	
		Average salvage depths[1]	7	17	18	42
3		**Cibeque Family – Wapiti Family complex, 3 to 8 percent slopes**				
	60	Cibeque Family	6	0	66	
	30	Wapiti Family	7	57	21	
	5	A Family	9	17	64	
	5	Calendar Family	5	23	14	
		Average salvage depths[1]	6	19	50	75
4		**Jonale Family – Graystone cobbly substratum Family – Wapiti Family complex, 3 to 8 percent slopes**				
	50	Jonale Family	9	23	47	
	25	Graystone cobbly substratum Family	12	20	0	
	15	Wapiti Family	7	57	21	
	5	D Family	11	16	59	
	5	A Family	9	17	64	
		Average salvage depths[1]	10	27	33	70
5		**Calendar Family – M Family - Drifity Family complex, 8 to 25 percent slopes**				
	40	Calendar Family	5	23	14	
	30	M Family	7	14	9	
	20	Drifity Family	10	0	0	
	10	Zigzag	4	15	0	
		Average salvage depths[1]	7	15	8	30

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Map Unit	Percent of Map Unit	Soil Types	Topsoil Depth	Good/ Fair Subsoil Depth	Poor Subsoil Depth	Average Total Salvage Depth
	%		inches	Inches	Inches	Inches
6		**Graystone – Cookcan – Jonale Family complex, 1 to 5 percent slopes**				
	45	Graystone	12	50	20	
	20	Cookcan	6	42	0	
	20	Jonale Family	9	23	47	
	15	I Family	12	42	0	
		Average salvage depths[1]	10	42	18	70
7		**Happyhollow Family - Alamosa complex, 1 to 5 percent slopes**				
	55	Happyhollow Family	11	21	42	
	20	Alamosa	10	81	0	
	10	Jicarilla Family	7	47	42	
	10	Tetonview Family	8	16	0	
	3	Brumley	9	76	0	
	2	Jonale Family	9	23	47	
		Average salvage depths[1]	10	37	28	75
8		**Brumley – Graystone - Snilloc complex, 3 to 8 percent slopes**				
	40	Brumley	9	76	0	
	30	Graystone	13	55	11	
	20	Snilloc	8	28	60	
	10	Jonale Family	9	23	47	
		Average salvage depths[1]	10	55	20	85
9		**D Family - Deacon complex, 5 to 30 percent slopes**				
	55	D Family	11	16	59	
	30	Deacon	9	27	12	
	10	A Family	9	17	64	
	5	Creek bottom	0	0	0	
		Average salvage depths[1]	10	19	42	71
10		**Zigzag clay loam, 8 to 25 percent slopes**				
	85	Zigzag	4	14	0	
	10	Drifity Family	10	0	0	
	5	Calendar Family	5	23	14	
		Average salvage depths[1]	5	13	1	19
11		**A family, 8 to 25 percent slopes**				
	85	A Family	9	17	64	
	10	Calendar Family	5	23	14	
	5	Zigzag	4	14	0	
		Average salvage depths[1]	8	17	56	81
12		**Manzanst Family clay loam, 3 to 12 percent slopes**				
	85	Manzanst Family very deep to shale	6	0	24	
	10	Manzanst Family deep to shale	6	0	20	
	5	A Family	9	17	64	
		Average salvage depths[1]	6	1	26	33
13		**A Family – Happyhollow Family complex, 1 to 5 percent slopes**				
	80	A Family	9	17	64	
	15	Happyhollow Family	11	21	42	
	5	I Family	12	42	0	
		Average salvage depths[1]	9	19	58	86

1. Weighted average salvage depths for map unit are the sum of soil type salvage depths multiplied by percent of map unit.

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Topsoil and Subsoil Quantities

The estimated quantities of topsoil and subsoil that will be salvaged from mining disturbance areas are contained in tables 4-3.1, 4-3.2, and 4-3.3. The estimated quantities of salvaged topsoil where facilities, roads, and stockpiles will be constructed are contained in table 4-4. Drawing 2-2 shows the topsoil and subsoil handling plan.

Table 4-3.1. Estimated topsoil and subsoil quantities that can be salvaged from year 1 mining disturbance areas.

Map Unit	Area	Topsoil	Good/ Fair Subsoil	Poor Subsoil
	acres	Cubic Yards	Cubic Yards	Cubic Yards
1	23.6	28,556	72,976	174,509
2	7.2	6,776	16,456	17,424
3	25.2	20,328	64,372	169,400
4	74.5	100,161	270,435	330,532
5	13.3	12,517	26,822	14,305
6	14.7	19,763	83,006	35,574
7	2.1	2,823	10,446	7,905
8	0.4	538	2,958	1,076
9	7.4	9,949	18,903	41,785
10	0.0	0	0	0
11	5.2	5,593	11,885	39,150
12	4.7	3,791	632	16,429
13	0.1	121	255	780
Total	178.4	210,916	579,146	848,869

Table 4-3.2. Estimated topsoil and subsoil quantities that can be salvaged from year 2 mining disturbance areas.

Map Unit	Area	Topsoil	Good/ Fair Subsoil	Poor Subsoil
	acres	Cubic Yards	Cubic Yards	Cubic Yards
1	0.0	0	0	0
2	0.0	847	2,057	2,178
3	19.4	15,649	49,556	130,411
4	1.8	2,420	6,534	7,986
5	0.0	0	0	0
6	1.2	1,613	6,776	2,904
7	35.0	47,056	174,106	131,756
8	0.8	1,076	5,916	2,151
9	0.0	0	0	0
10	7.8	5,243	13,633	1,049
11	1.6	1,721	3,657	12,046
12	12.9	10,406	1,734	45,093
13	0.0	33,396	70,503	215,219
Total	109.0	119,427	334,471	550,792

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Table 4-3.3. Estimated topsoil and subsoil quantities that can be salvaged from year 3 mining disturbance areas.

Map Unit	Area	Topsoil	Good/ Fair Subsoil	Poor Subsoil
	acres	Cubic Yards	Cubic Yards	Cubic Yards
1	0.0	0	0	0
2	0.0	0	0	0
3	0.0	0	0	0
4	0.0	0	0	0
5	0.0	0	0	0
6	0.0	0	0	0
7	11.4	15,327	56,709	42,915
8	6.6	8,873	48,803	17,747
9	0.0	0	0	0
10	0.0	0	0	0
11	0.0	0	0	0
12	18.1	14,601	2,433	63,270
13	2.4	2,904	6,131	18,715
Total	38.5	41,705	114,076	142,646

Table 4-4. Estimated topsoil quantities that will be salvaged where facilities, roads, and stockpiles will be constructed in Coal Hollow project area during year 1.

Map Unit	Facilities, Roads, and Stockpile Disturbance Area	Topsoil
	acres	cubic yards
1	36.7	44,407
2	13.2	12,423
3	0.3	242
4	8.6	11,562
5	14.6	13,740
6	0.0	0
7	4.5	6,050
8	11.1	14,923
9	16.4	22,049
10	1.1	739
11	6.7	7,206
12	0.0	0
13	1.0	1,210
Totals	107.5	134,552

Estimated quantities of salvaged topsoil and subsoil should be sufficient to construct a reclamation profile with a minimum thickness of 48 inches as required by Utah DOGM regulations (p. 4, Utah DOGM, 2005). Table 4-5 lists the total estimated quantities of topsoil and subsoil by mining year and the resulting soil profile that could be constructed, if all of the estimated material was salvaged. These estimated quantities are presented for the purpose of illustrating that there

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should be sufficient quantities of topsoil and subsoil to construct a 48 inch soil profile.

Topsoil replacement on the roads, facilities, and stockpile areas is estimated to be 8 to 9 inches.

Table 4-5. Estimated total quantities of topsoil and subsoil by mining year[1].

Mining Year	Topsoil Salvage	Good/Fair Subsoil Salvage	Poor Subsoil Salvage	Acres
	Cubic Yards	Cubic Yards	Cubic Yards	Cubic Yards
1	210,916	579,146	848,869	178.4
2	119,427	334,471	550,792	109.0
3	41,705	114,076	142,646	38.5
Total	372,048	1,027,693	1,542,306	325.9

1. Quantities are for mined areas only and do not include materials salvaged from roads, facilities, and stockpile areas.

Table 4-6. Potential reclamation soil profile thickness based on estimated topsoil and subsoil quantities listed in table 4-5 for the mining disturbance areas.

Mining Year	Topsoil Salvage	Good/Fair Subsoil Salvage	Poor Subsoil Salvage	Total Reclamation Profile Depth
	Inches	Inches	Inches	Inches
1	9	24	36	70
2	8	23	38	69
3	8	22	28	58
Weighted Project Average[1]	8.5	23.5	35.2	67

1. Weighted average determined by multiplying the depth for each year by the respective acres, summing the values and then dividing by the total project acres. Acres are listed in Table 4-5.

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Native Soil Profile Features

The combined depth of topsoil and subsoil varies in native soil profiles within the Coal Hollow project area depending on physiographic setting and soil texture. The depth to which soil carbonates have leached over time is an indicator of how deep soil moisture normally penetrates. Variations in available water holding capacity (determined by soil texture, EC, and SAR) result in varying soil depths, but are similar within soil types. Table 5-1 contains the average depths to carbonates, poor soil pH, or unsuitable SAR levels by soil map unit.

Table 5-1. Average depths to limiting soil features by map unit.

Map Unit	Depth to Limiting Soil Feature	Limiting Soil Feature
	inches	
1	33	Soil carbonate accumulation.
2	37	Soil carbonate accumulation. Moderately deep to shale. Fair EC and SAR.
3	22	Soil carbonate accumulation and pH.
4	30	Soil carbonate accumulation and pH.
5	32	Moderately deep or shallow to shale.
6	18	Poor to unacceptable pH and carbonate accumulation.
7	30	Soil carbonate accumulation and pH.
8	36	Soil carbonate accumulation and pH.
9	36	Poor pH and soil carbonate accumulation.
10	19	Shallow to shale.
11	24	Soil carbonate accumulation.
12	24	Heavy clay texture and pH.
13	26	Soil carbonate accumulation and pH.
Ave	30	Average does not include map units 6 (very limited area) ad 10 (shallow soils) and is not weighted by amount of map unit occurence.

Overburden Quality

SAR and pH are limiting features of the Tropic shale overburden that can have an impact on the establishment of acceptable post mining vegetation. SAR levels in shale overburden from core hole 5 ranged from 33.4 to 52.4. The pH ranged from 8.3 to 9.5 in the core hole 5 samples. Unacceptable SAR levels of 15.9 to 52.2 were also identified in core hole 7. These SAR levels are well above the Utah DOGM's poor range for soil and soil substitutes. It will be important to have adequate depth of suitable cover above this unsuitable material. Utah DOGM Guidelines for Management of Topsoil and Overburden stipulates a minimum of "four feet of cover is required over any toxic or acid-forming materials (p. 4, Utah DOGM, 2005)."

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SAR and pH levels in mixed alluvium samples from core hole 3 were within the Utah DOGM good to fair range.

Reclamation Soil Profile Depth

The soil depths listed in table 5-1 represent the average depths to which natural soil development has taken place over time based on normal climatic patterns for the Alton, Utah area. Alton Coal Development will construct a post mining reclamation soil profile that is a minimum 48 inches thick (p. 4, Utah DOGM, 2005). This depth is 1.55 times the native depth to limiting soils features (see table 5-1). It will hold approximately 8.64 inches of moisture (one half of normal October March precipitation) based on an available water capacity (AWC) of 0.18 inches of water per inch of soil. The AWC of 0.18 inches of water per inch of soil is the low end for heavy clay loams, clays, and silty clays, which are dominant in the Coal Hollow project area.

Stockpile and Placement of Topsoil and Subsoil

Topsoil and subsoil will be salvaged and stockpiled or directly placed in its final location separately. Alton Coal Development will minimize the stockpiling of topsoil and subsoil by implementing direct placement of these soil materials as much as possible. Direct placement of topsoil and subsoil will minimize impacts on the soil resource. Topsoil and subsoil stockpiles will be identified with signs and protected from other mining activities. Topsoil and subsoil stockpile locations are shown on Drawing 2-2.

Topsoil and subsoil stockpiles will be protected from wind and water erosion until vegetation has become established.

Topsoil placement depths will range from 6 to 12 inches depending on the soil type and map unit that is being salvaged. It is anticipated that the average topsoil placement depth will be 9 inches in both mined and non-mined areas.

The balance of the 48 inch reclamation soil profile will consist of subsoil. Approximately 90 percent of the subsoil will be comprised of soil with good or fair pH and lime characteristics. The remaining subsoil may have soil pH or lime characteristics in the poor range, if adequate quantities of good to fair subsoil are not identified during salvage operations. No subsoil or overburden with any unacceptable characteristics will be placed within 48 inches of the final reclamation surface (Utah DOGM, 2005).

Substitute Subsoil

The depth of overburden overlaying the Tropic shale ranges from a few feet to fifty feet or more. Laboratory analysis of this material indicates that some of it is similar in quality to the native subsoil, based on the Utah DOGM soil suitability

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guidelines (Utah DOGM, 2005). Depending on location, the upper twenty to fifty feet of mixed alluvial (non-shale) overburden is suitable for use as substitute subsoil, based on lab analysis of samples from deep backhoe pits at core hole locations 1, 3, 5, and 6 in April 2007, and core hole 8 in November 2007. Table 5-2, shows the maximum, minimum, and average lab analysis values for the April 2006 core hole samples. The average values in table 5-2 represent an estimate of the resulting values when material from below the topsoil layer and above thirty feet is mixed during excavation. Laboratory analysis results of this overburden testing are in appendix C.

Table 5-2. Ranges and averages of soil suitability for overburden sampled from pits adjacent to core holes 1, 3, 5, and 6 (April 2007) and core hole 8 (November 2007). Data is for alluvial material above 40 feet. Tropic shale overburden is unsuitable for use as subsoil substitute and has not been included in this table.

	Maximum	Minimum	Average
Sand % Silt % Clay % texture	82.0 61.0 61.0	0 13.0 5.0	35.3 35.9 28.8 Clay Loam
pH	8.4	7.8	8.2
ECe (ms/m)	4.20	0.25	0.67
Saturation %	97.6	20.2	52.6
SAR	3.94	0.05	0.63
AcidBase Potential t/kT	650	160	315
Lime %	64.7	15.6	31.56
Organic Carbon	1.21	0.11	0.46
Boron	0.40	<0.10	0.29

The only parameter listed in table 5-2 with an average value that could be limiting to the establishment of vegetation would be the percent lime. Percent lime values for 9 of the 16 samples are between 15 and 30 percent, which puts them in the fair category (Utah DOGM, 2005).

Tropic shale is closer to the surface at the core hole 7 location which has resulted in the overburden being unacceptable for use as subsoil. SAR values ranges from 15.9 to 52.2 below 6 feet. Conductivity in this material ranges from 0.90 to 10.0 mmhos/cm. Percent clay ranges 49 to 61 percent. Materials similar to that characterized by core hole 7 should not be used as substitute subsoil within the 48 inch reclamation soil profile; and should be covered with as much suitable alluvium as possible.

ACD will conduct a monitoring program in the field during mining operations to ensure that only materials with good or fair suitability are placed in the upper 4 feet of the reclamation soil profile (p. 4, Utah DOGM's *Guidelines for Management of Topsoil and Overburden,* 2005). Representative overburden samples will be analyzed for SAR at a qualified laboratory. A detailed description of the subsoil monitoring program is provided in Chapter 2 under Section R645-301-232.500, page 2-24.

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service
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Priscilla Burton
Environmental Scientist III
Division of Oil, Gas and Mining
State of Utah- Department of Natural Resources
PO Box 145801
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

RE: Prime Farmland Determination, Alton Coal Development Company, LLC, Proposed Coal Hollow Mine, C/025/0005, Task ID#2567

Dear Priscilla:

As requested, a Farmland Conversion Impact Rating (Form AD 1006) is enclosed, for the proposed Coal Hollow Mine area, located near Alton City in Kane County, Utah.

No Prime Farmland or Soils of Statewide Importance were found within the study area, per criteria outlined in the National Soil Survey Handbook Part 622 and Exhibit UT603-1, respectively. No NRCS published, or SSURGO certified soil survey data exists for the project area, so an on-site investigation, soil sampling and descriptions were used for this assessment. Although soils within the proposed activity area do not presently meet the criteria for Prime Farmland or Soils of Statewide Importance (SSI), they could classify as Soils of Statewide Importance, if irrigated.

Soils are alluvium and residuum, primarily formed from Tropic Shale parent material that exhibit mollic epipedons and contain little to no rock fragments on the soil surface or in the soil profiles, to a depth of 60 inches. Subsurface textures are typically silty clay, with the upper horizons from 0 to 27 inches ranging from silty clay loam to clay loam textures. Visible calcium carbonate and salt concentrations were observed in the soil profile, ranging from 10 inches to 27 inches deep and extending to depths of 60 inches or greater. Slopes range from 1 to 10 percent, with some minor areas exceeding 20 percent. Observed soils are predominantly Fine, mixed, superactive, mesic Pachic Calciustolls and Fine, mixed, superactive, mesic Aridic Natrustolls.

An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI. In the case

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of SSI, a reliable source of water is the only factor that excludes soils from classifying as such where slopes are less than 14 percent.

In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability rates.

Within the scope of the proposed project area, no conversion of Prime Farmland or Soils of Statewide Importance would occur because soils in the project area do not classify as such.

If you need any additional information of have questions, please do not hesitate to contact me.

Sincerely,

Corey Meier
Soil Scientist

Enclosures

Cc: Michael Domeier, State Soil Scientist, SLC, UT

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U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 10/30/06
Name Of Project Proposed Coal Hollow Mine	Federal Agency Involved USDA - NRCS
Proposed Land Use Coal mine	County And State Kane, Utah
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).* Yes ☐ No ☑ | Acres Irrigated | Average Farm Size

Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined In FPPA Acres: %
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS

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	0.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* 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 NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site 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	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection 10/30/06	Was A Local Site Assessment Used? Yes ☒ No ☐

Reason For Selection: The project impacts Fine, mixed, superactive, mesic Pachic Calciustolls and Fine, mixed, superactive, mesic Aridic Natrustolls. No NRCS SSURGO certified soil survey presently exists for the project area. Impacted soils and determinations were evaluated by conducting a local site assessment. Observed soils do not classify as Prime Farmland, but do classify as Soils of Statewide Importance, if irrigated. Because no irrigation is present, soils do not classify as Soils of Statewide Importance.

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(See Instructions on reverse side)

Form AD-1006 (10-83)

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STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C together with maps indicating locations of site(s), to the Natural Resources Conservation Service (NRCS) local field office and retain copy D for their files. (Note: NRCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field office locations are available from the NRCS State Conservationist in each state).

Step 3 – NRCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

Step '4 – In cases where farmland covered by the FPPA will be converted by the proposed project, NRCS field offices will complete Parts II, IV and V of the form.

Step 5 – NRCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for NRCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal policies.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as shown in § 658.5 (b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood control, criteria #5 and #6 will not apply and will, be weighed zero, however, criterion #8 will be weighed a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 12 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points, and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

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Taxonomic classification of the soil profiles was finalized using the field description notes, results of laboratory analysis of soil samples, and examination of the micromonolith box samples. The following diagnostic soil horizons were identified in some of the Coal Hollow soil profiles.

- Mollic epipedons (dark soil surface);
- Calcic horizon (accumulation of secondary calcium carbonates);
- Cambic horizon (indication of soil development);
- Argillic horizon (accumulation of illuvial clays);
- Aquic conditions (presence of ground water in the soil profile), and
- Lithic or paralithic contact with sandstone or shale parent material.

Mollic epipedon determination is based on the soil color using the Munsell Soil Color Charts. Surface dry colors must have a value of 5 or less with a chroma of 3 or less, while the moist color must have a value of 3 or less with a chroma of 3 or less.

Calcic horizons must be at least 6 inches thick and have secondary calcium carbonates in the subsurface or subsoil. The amount of calcium carbonate required is dependent on the percent clay in the fine-earth fraction.

Cambic horizons are an indication of early soil development. Soils with moderate or strong soil structure in the subsurface are an indication of a cambic horizon.

Argillic horizons are identified by an accumulation of illuvial clay in a subsurface horizon. The amount of clay increase is based on the overlying soil horizon. The presence of clay films in the argillic horizon is also required.

Aquic conditions are identified in the soil profile by the presence of redox concentrations, mottled soil colors, or gleyed colors. The depth at which these features occur determines the suborder (less than 20 inches) or sub-group (20 to 30 inches) classification of the soil. The presence of aquic features below 30 inches does not have an effect on the taxonomic classification of the soil, but was included in the soil type description.

Lithic or paralithic contacts are diagnostic when shale or sandstone occurs within 20 inches or the soil surface. Moderately deep contacts (20 to 40 inches deep) are identified in the soil type descriptions.

It was not possible to correlate the Coal Hollow soil profiles to established soil series. Because most of the established series within the taxonomic soil families were from areas with warmer soil temperatures, longer growing seasons, or other dissimilar features. Most of the established soil series were from eastern New Mexico, southeastern Colorado, northeastern Wyoming, or the Dakotas. Soils in the Alton, Utah area have not been mapped by the Natural Resource Conservation Service (C. Meier, 2006).

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Table B-1. Taxonomic classification of soil pedons sorted by pedon, Coal Hollow Soil Survey.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
LOF-1	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
LOF-2	D Family	2	fine, mixed, superactive, mesic Aridic Calciustoll
LOF-3	M Family	2	fine, mixed, superactive, mesic Aridic Calciustept
LOF-4	Calendar Family	2	fine, mixed, superactive, mesic Aridic Haplustepts
RDV-5	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
RDV-6	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
RDV-7	D Family	4	fine, mixed, superactive, mesic Aridic Calciustoll
1YR-8	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9A	Graystone	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9B	Cookcan	6	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll
1YR-10	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-11	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-12	M Family	2	fine, mixed, superactive, mesic Aridic Calciustept
SP-13	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-14	I Family	6	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-15	Graystone	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-16	Jonale Family	6	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-17	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-18A	Alamosa	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-18B	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-19	Wapiti Family	4	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
WRD-20	Graystone	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-21	Snilloc	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustept
WRD-22	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
WRD-23	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
DAH-24	Calendar Family	5	fine, mixed, superactive, mesic Aridic Haplustepts
DAH-25	M Family	5	fine, mixed, superactive, mesic Aridic Calciustept
SP-26	N Family	1	fine, mixed, superactive, frigid Aquic Calciustoll
SP-27	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-28	A Family	11	fine, mixed, superactive, mesic Aridic Calciustept
SP-29	D Family	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-30	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-31	Wapiti Family	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-32	Wapiti Family	1	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-33	D Family	1	fine, mixed, superactive, mesic Aridic Calciustoll
SP-34	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-35	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-36	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-37	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-38	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-39	Graystone cobbly	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-40	Tetonview Family	7	fine-loamy, mixed, superactive, frigid Aeric Calciaquoll
SP-41	D Family	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-42	Deacon	9	fine-loamy, mixed, superactive, mesic Aridic Haplustoll
SP-43	Jicarilla Family	7	fine, mixed, superactive, frigid Typic Argiaquoll
SP-44	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-45	Happyhollow Family	13	fine, mixed, superactive, frigid Aeric Epiaquept
SP-46	Alamosa	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
SP-47	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf

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Table B-1. Taxonomic classification of soil pedons sorted by pedon, Coal Hollow Soil Survey.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
SP-48	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf
SP-49	Drifiity Family	5	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent
SP-50	Zigzag	10	clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent
SP 51	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-52	I Family	13	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-53	Disturbed		Disturbed
SP-54	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-55	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-56	Wapiti Family	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-57	Cibeque Family	13	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-58	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf
SP-59	A Family	13	fine, mixed, superactive, mesic Aridic Calciustept
SP-60	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf

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Table B-2. Taxonomic classification of soil pedons sorted by soil type, Coal Hollow Soil Survey.

Pedon	Soil Type	Map Unit	Taxonomic Family Classification
LOF-1	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-27	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-28	A Family	11	fine, mixed, superactive, mesic Aridic Calciustept
SP-30	A Family	1	fine, mixed, superactive, mesic Aridic Calciustept
SP-59	A Family	13	fine, mixed, superactive, mesic Aridic Calciustept
SP-46	Alamosa	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
WRD-18A	Alamosa	7	fine-loamy, mixed, superactive, frigid Typic Argiaquoll
SP 51	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
SP-47	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
WRD-22	Brumley	8	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf
DAH-24	Calendar Family	5	fine, mixed, superactive, mesic Aridic Haplustepts
LOF-4	Calendar Family	2	fine, mixed, superactive, mesic Aridic Haplustepts
RDV-6	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-13	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-55	Cibeque Family	3	fine-loamy, mixed, superactive, mesic Aridic Calciustept
SP-57	Cibeque Family	13	fine-loamy, mixed, superactive, mesic Aridic Calciustept
1YR-9B	Cookcan	6	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll
LOF-2	D Family	2	fine, mixed, superactive, mesic Aridic Calciustoll
RDV-7	D Family	4	fine, mixed, superactive, mesic Aridic Calciustoll
SP-29	D Family	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-33	D Family	1	fine, mixed, superactive, mesic Aridic Calciustoll
SP-41	D Family	9	fine, mixed, superactive, mesic Aridic Calciustoll
SP-42	Deacon	9	fine-loamy, mixed, superactive, mesic Aridic Haplustoll
SP-53	Disturbed		Disturbed
SP-49	Drififfy Family	5	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent
1YR-11	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-9A	Graystone	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-15	Graystone	6	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-36	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-37	Graystone	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-20	Graystone	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-39	Graystone cobbly	4	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-38	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-44	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-45	Happyhollow Family	13	fine, mixed, superactive, frigid Aeric Epiaquept
SP-54	Happyhollow Family	7	fine, mixed, superactive, frigid Aeric Epiaquept
SP-14	I Family	6	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-52	I Family	13	fine-loamy, mixed, superactive, frigid Aquic Calciustept
SP-43	Jicarilla Family	7	fine, mixed, superactive, frigid Typic Argiaquoll
1YR-10	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
1YR-8	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
RDV-5	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-16	Jonale Family	6	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-34	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
SP-35	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-17	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-18B	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll
WRD-23	Jonale Family	4	fine-loamy, mixed, superactive, mesic Aridic Calciustoll

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Table B-2. Taxonomic classification of soil pedons sorted by soil type, Coal Hollow Soil Survey.

1YR-12	M Family	2	fine, mixed, superactive, mesic Aridic Calciustept
DAH-25	M Family	5	fine, mixed, superactive, mesic Aridic Calciustept
LOF-3	M Family	2	fine, mixed, superactive, mesic Aridic Calciustept
SP-48	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf
SP-58	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf
SP-60	Manzanst Taxa Family	12	very fine, mixed, superactive, mesic Aridic Haplustalf
SP-26	N Family	1	fine, mixed, superactive, frigid Aquic Calciustoll
WRD-21	Snilloc	8	coarse-loamy, mixed, superactive, mesic Aridic Calciustept
SP-40	Tetonview Family	7	fine-loamy, mixed, superactive, frigid Aeric Calciaquoll
SP-31	Wapiti Family	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-32	Wapiti Family	1	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-56	Wapiti Family	3	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
WRD-19	Wapiti Family	4	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll
SP-50	Zigzag	10	clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent

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Hridic Calcisol / UTM 0871325 4140717

USDA - Forest Service — SOIL DESCRIPTION (Reference FSH 2509.18) #13 (P) LOF-1

Fine, smectitic, superactive, mesic

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Step No.	7. USGS Quad	8. Location:
1	FINE, SMECTITIC TYPIC ~~Haxigrid~~	9-12-06	BC	2-3 (K)	LOF 1	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
LOAD OUT AREA COAL HOLLOW PROJECT, PRIVATE LAND		2 MI. SOUTH OF ALTON, UTAH	UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
LANDSLIDE DEPOSIT ALLUVIUM + COLLUVIUM	STRAIGHT CLIFFS FM + TROPIC SHALE	70	NONE → SLIGHT	RILL

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
ALLUVIAL FANSLOPE	3	PLANAR	150'	280	SPD	2	1	0	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
WYOMING BIGSAGEBRUSH - GRASSES, FORBS	15-17"		> 5 FT

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) LAB	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB! FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 4/2	10YR 5/2	/	CLAY LOAM SICL 36	1MPL → FGR	SD	VFR	SS/PS	/	CR-0 CB-0 ST-0	3VF 2F,M 1C	2VF IN 1F TU	ST	7.3	C,S
BK1 C1	6-12	2.5Y 4/3	2.5Y 5/2	/	CLAY LOAM SIC 36	2M-C ABK	SHA	VFI	VS/VP	/	CR-0 CB-0 ST-0	2VF 1F,M,C	1VF TU	ST	8.3	G,W
BK2 C2	12-24	2.5Y 5/3	2.5Y 6/2	/	SIC 42	3M-C PR	VH	VFI	VS/VP	/	CR-0 CB-0 ST-0	1VF 1F	1VF TU	ST	8.5	G,S
BK3 C3	24-42	2.5Y 5/3	2.5Y 6/2	/	SIC 46	3MPR → 3ABK	EHA	EFI	VS/VP	/	CR-0 CB-0 ST-0	1VF	V.1VF TU	ST	8.7	G,W
CR	42-60	2.5Y 5/2	2.5Y 7/2	/	CLAY SIC 42	MASSIVE	EH	EFI	VS/VP	/	CR-0 CB-0 ST-0	/	/	ST	8.4	G,W
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

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26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	42"		> 5 FEET

28 Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC	10-30"

USDA - Forest Service

Aridic Calciustept

SOIL DESCRIPTION

(Ref. SII 2509.18) #14 (P) LOF-2

UTM 0371357 4[illegible]792

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
2	mixed, super, mesic FINE	9-12-06	BC	4-5 (V)	LOF-2	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
Soil Survey	PRIVATE LANDS 2 MI. SOUTH OF ALTON	UTAH	UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
LANDSLIDE DEPOSIT LANDSLIDE - COLLUVIUM	TRIASSIC SH + STR. CLIFFS	FM 70	NONE → SLIGHT	ROLL

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FOOTSLOPE - TOESLOPE	6	PLANAR	150'	200	SPD	2	2	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
ARTNA - RABB. + BRUSH + GRASSES	15-17"		>8 FT.

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) LAB	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A1	0-7	10YR 3/2	10YR 5/3		CLAY LOAM SiL 31	2M-C PL → FGR	SO	VFR	S/P		CR - CB - ST -	3VF 2F,M 1C	2VF IN 2F TU	ST	7.6	C, S
A2 ~~CH1~~	7-12	10YR 4/2	10YR 5/2		CLAY LOAM SiC 32	2M-F ABK	VH	VFI	S/VP		CR - CB - ST -	2VF 2F,M 1C	2VF IN 1F TU	ST	7.7	C, W
Bwk1 ~~CH2~~	12-24	2.5Y 4/3	2.5Y 6/2		SiC 46	3C-M PR → 3ABK	EHA	EFI	VS/VP		CR - CB - ST -	1VF-F	1VF TU	ST	7.8	G, W
Bwk2 ~~CH3~~	24-48	2.5Y 4/3	2.5Y 6/3		CLAY SiC 41	3M-C ABK	EHA	EFI	VS/VP		CR - CB - ST -	1VF	1VF TU	ST	8.0	G, I
BK ~~CH4~~	~~48-72~~ 72	2.5Y 5/3	2.5Y 7/2		SiC 45	MASSIVE	EHA	EFI	VS/VP		CR - CB - ST -		1VF TU	me ~~SE~~	7.8	G, W
~~CH5~~	72-96	2.5Y 5/3	2.5Y 7/3		CLAY 47	MASSIVE	EHA	EFI	VS/VP		CR - CB - ST -			me ~~SE~~	7.8	G, W
											CR - CB - ST -					
											CR - CB - ST -					
											CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40	38	0	> 5 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	—	10-30"

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FS 2500-1 (2/06)

4 SAMPLES TAKEN — Aridic Calciustept (Reference FSH 2509.18) 50-51 (K) UTM 4140866

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
2	Fine, ~~smectitic~~ mixed, ~~isomesic~~ Typic super, mesic	9-18-09	BC	16-11 (P)	LOF-3	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
LOAD OUT AREA	MODERATELY DEEP		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / COLLUVIUM / LSD	TROPIC / SIR. CLIFFS TO		NONE-SLIGHT	RILL

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FANSLOPE - TOESLOPE	12	CONVEX	200	160°	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - RABBITBRUSH	15-17		NONE TO 5 FT

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-4	10YR 3/3	10YR 4/3	/	LOAM SIL	28	1M-CPL → FGR	SO	VFR	SS PS	/	GR - CB - ST -	2VF 1F,M	2VF IN 1F TU	SE	8.1	G,S
Bw1 CT	4-11	10YR 4/3	10YR 5/2	/	CLAY LOAM SICL	28 32	3M-CPR → 3 ABK	SH	FI	S P	/	GR - CB - ST -	2VF 1F,M	2VF IN 1F TU	ST	8.3	G,W
Bwk C2	11-19	2.5Y 4/3	2.5Y 6/2	/	SICL SILTY CLAY	34	3MPR → 3 ABK	VH	VFI	VS VP	/	GR - 0 CB - 0 ST - 0	1VF 1F	1VF TU	ST	8.1	G,W
BK C3	19-33	2.5Y 5/3	2.5Y 6/2	/	SILTY CLAY SICL	40 37	3 M-C ABK	VH	VFI	VS VP	/	GR - 0 CB - 0 ST - 0	1VF	1VF TU	ST	8.4	G,W
Cr	33+	SOFT TROPIC			SICL	45	SINGLE	BEDROCK				GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-33"	37	0	33"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC	10-30"

Previous edition [illegible]lete.

FS-2500-1 (2/06)

INCORPORATED OCT 1 5 2009 DIV. OF OIL, GAS & MINING

USDA - Forest Service

Aridic Haplustept

SOIL DESCRIPTION (Reference: SSH 2509.18) 52-53 K

UTM 4140

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
2	FINE, ~~SMECTITIC~~ TYPIC USTORTHENT mixed mesic	9-18-06	BC	12-13 (P)	LOF-4	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
LONDON FACILITY COALHOLLOW SOIL SURVEY	PRIVATE LANDS 2½ MI. SE OF ALTON		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM / LANDSLIDE DEPOSITS FROM STRAIGHT CLIFFS + TROPIC		70	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock	
TOESLOPE - FANSLOPE	6	CONVEX	220'	190°	SPD	CHEMICAL CRUST a. GR 0 b. CB 0	c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH RABBITBRUSH	15-17"		NONE TO 5 FT.

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) LAB	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-5	10YR 4/2	10YR 6/3		SILT LOAM SIL 42 23	2M-F PL → 1FGR	SO	VFR	SS PS		GR-0 CB-0 ST-0	3VF 2F-M 2C	3VFIN	SE	7.8	C,S
Bw1 C1	5-10	10YR 4/2	10YR 6/2		SIC 40	2M-F SBK	SO	FR	S P		GR-0 CB-0 ST-	2VC-F 1M,C	2VFIN 2FTV	ST	7.7	C,W
Bw2 C2	10-19	2.5Y 4/2	2.5Y 6/2		SIC 45	3C-M PR	VH	VFI	VS VP		GR-0 CB-0 ST-0	1VF-F 1M	2VFIN	ST	7.8	G,W
Bw3 C3	19-31	2.5Y 4/3	2.5Y 6/3		SIC 44	3MPR → 3ABK	VH	VFI	VS VP		GR-0 CB-0 ST-0	VVF	1VFIN	ST	7.9	G,W
C4	31+ *				CLAY SIC OR -	CLAY MASSIVE	EH	EFI	ES EP		GR-0 CB-0 ST-0		1VF TV	ST	7.8	
											GR- CB- ST-					
	* NO LAB ANALYSES										GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	42	0	> 50 INCHES

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	CALCIC ?	10-30

Previous edition obsolete. FS-2500-1 (2/86)

Marginal increase for calcic - correlate to Aridic calciustept

Div. of Oil, Gas & Mining OCT 15 2006 RECEIVED

USDA - Forest [redacted] Aridic Calciustoll / Fluventic Haplustoll

SOIL DESCRIPTION

(Reference [redacted] 12509.18)

RDV-5 / UTM 414[redacted]8

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
4	Fi-loamy, mixed, super, mesic ~~Haplustoll~~	9/13/06	BC	13-14-15	16	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / RESIDUUM	MIXED SEDIMENTARY		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
ALLUVIAL FANSLOPE	4	CONVEX	170'	250°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PINYON-JUNIPER W/ BIG SAGEBRUSH	15-17"		NONE

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) LAB, FIELD	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A1	0-5	10YR 3/3	10YR 5/3	/	LOAM	18	2M-F GR	SO	VFR	SO/PO	/	CR-0 CB-0 ST-0	2VF 2F IC	3VF IN 2F TU	SE	8.1	C,W
A2	5-10	10YR 3/4	10YR 5/4	/	LOAM	20	2M-F SBK	SH	FR	SO/PO	/	CR- CB- ST-	2F IVF IM-C	2VF-F IN	ST	8.1	G,W
BK ~~CKT~~	10-25	10YR 5/4 10YR 5/6	10YR 6/4 (80) 10YR 6/6 (20)	/	SANDY LOAM	14	2C-M SBK	HA	FI	SS/PO	/	CR- CB- ST-	IVF IF	2VF-F TU	ST	8.4	A,S
2C1 ~~2CT~~	25-48	2.5Y 5/3	2.5Y 6/2	/	SILT LOAM	12	3M-C ABK	EH	EF	SS/SP	/	CR- CB- ST-	V.VF	IVF TU	ST	8.8	G,W
2C2	48-60	2.5Y 5/2	2.5Y 7/2	/	LOAM	22	MASSIVE	EH	EF	SS/PS	/	CR- CB- ST-	/	IVF TU	ST	9.0	
												CR- CB- ST-					
												CR- CB- ST-					
												CR- CB- ST-					
												CR- CB- ST-					

Div. of Oil, Gas & Mining
INCORPORATED
OCT 15 2009

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	15	0	>60 INCHES

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CAMBIC / CALCIC	10-30"

FS 2500-1 (2/96)

USDA - Forest Service ~~Aridic~~ Aridic Calciustept ~~Ustifluvent~~ OR

SOIL DESCRIPTION

(Refer to Soil 2509.18)

RDV-6 UTM 4140247 = 0370961

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
3	~~Coolony~~ fine ~~Harpsbarge~~	9-13-06	BC	17, 18-19	RDV-6	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Cool Hollow	, mixed, super, mesic		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM OVER RESIDUUM	TROPIC SHALE	68	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
	3	Plane	250'	290°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - RABBITBRUSH	15-17"		>80 cm

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/4	10YR 5/3	/	LSAND 6	1MGR	LO	LO	SO/PO	/	GR - CB - ST -	3VF,F 2M,C	3VF IN	ST	8.1	C,W
A2	6-12	10YR 4/2	10YR 5/4	/	LSAND 6	1MSBK → SG	SO	VFR	SO/PO	/	GR - CB - ST -	2VF, 2F 1M	3VF IN	ST	8.3	C,S
BK1 ~~AC~~	12-24	10YR 4/3	10YR 6/3	/	LOAM 18	2M-F SBK	SH	FI	SS/PO	/	GR - CB - ST -	2VF 1F	2VF IN 1F TU	ST	8.0	A,S
BK2 ~~CK~~	24-34	10YR 4/3 10YR 4/6	10YR 6/3 10YR 6/6	(75) (25)	SANDY LOAM 8	3M-C SBK	HA	VH	SO/PO	/	GR - CB - ST -	1VF	2VF IN 1F TU	ST	8.3	G,S
2C	34-60	10YR 4/3	10YR 6/2	/	SILTY CLAY 40	MASSIVE	EH	EFI	VS/VP	/	GR - 0 CB - 0 ST - 0	1VF	1VF TU	SE	8.5	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	<10	0	>60"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC W/MIXNG	CALCIC	10-30"

PSC clay is 18.3% based on lab data

INCORPORATED OCT 15 2009 Div. of Oil, Gas & Mining

USDA - Forest Service — SOIL DESCRIPTION (Refer to SII 2509.18) — RDV-7 — UTM 41408 — 03709.07

mixed, super, mesic

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
4	Aridic Calciustoll Fine ~~Fine~~ ~~Historthent~~	9-13-06	BC	20.21	RDV-7	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow	Approx. 2 mi SE of Alton Private Land		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium over Residuum	Mixed Alluvium / Tropic Shale		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Fanslope	3	SL convex	150'	255	SPO	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Big sagebrush - rabbitbrush	5-17"		>6 ft

HORIZON DESIGNATION (a)	DEPTH (b) (inches)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) (LAB)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/2	10YR 5/2	/	CLAY LOAM 23	1M-F GR	SO	VFR	SS/PS	/	CR - CB - ST -	3VF 3F 2M 1C	3VF IN	SE	7.5	C.W
A2	6-12	10YR 4/3	10YR 5/2	/	CLAY 44	2M-F SBK	HA	FI	VS/VP	/	GR - CB - ST -	2VF 2F M 1C	2VF IN 1F TY	SE	7.6	G.W
2BK1	12-24	2.5Y 4/2	2.5Y 6/2	/	CLAY 47	2C-M ABK	HA	EFI	VS/VP	/	GR - CB - ST -	1F, 1M	1VF TU	ST	8.0	G.S
2BK2	24-60	2.5Y 4/3	2.5Y 6/2	/	CLAY 44	3C-M ABK	VH	EFI	VS/VP	/	GR - 0 CB - 0 ST - 0	/	1VF TU	ST	8.0	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section — a. Depth: 10-40" — b. Average Clay %: 45 — c. Average Rock Fragment Content: 0 — 27. Depth to Lithic or Paralithic Contact: >60"

28. Diagnostic Horizons — a. Surface: Mollic w/ Mixing — b. Subsurface: Calcic — 29. Moist Control Section Depth: 10-30"

INCORPORATED OCT 15 2009 Div. of Oil, Gas & Mining

FS 2509.18 (12/06)

USDA - Forest Service

SOIL DESCRIPTION

(Ref. SII 2509.18) KUDAM

Super, mesic Aridic Calciustoll

UTM 037110 4139829

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
#4	Fi-Lum ~~Entic~~ ~~Argi~~ Ustoll	9-12-06	BC	2 PITS	1YR-8	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
1YR FOR Holman MINE	3 MI SE OF ALTON PRIVATE LAND		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	MIXED SEDIMENTARY		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
ALLUVIAL FAN	2	CONCAVE	100'	230°	WELL WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH, PINYON, CHNA	15-17"		>7½ FT

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 3/3	10YR 5/3		SICL	30 22	1MPL 2MGR	SH	FR	SS PO		CR-0 CB-0 ST-0	3VF 2F,M	3VF IN	NE	8.0	C,S
Bwk AB	8-14	10YR 4/3	10YR 6/3		SICL	30	2M-F SBK	HA	FI	S/P		CR-0 CB-0 ST-0	2VF 1F,M	2VF IN 1F TV	SE	8.1	C,W
Bwk BW	14-22	10YR 4/4	10YR 7/3		LOAM SICL	22	2C-M SBK	HA	VFI	S/P		CR-0 CB-0 ST-0	1F 1VF	1VF,F TV	ST	8.5	C,W
Bwk BW2	22-45	10YR 5/4	10YR 7/3		LOAM SCL	16	2M-F SBM	HA	VFI	SO PO		CR-0 CB-0 ST-0	1VF	1VF,F TV	ST	8.9	C,S
2C1	45-65	10YR 5/4	10YR 7/4		LOAMY SAND SL	8 14	MASSIVE	SO	FR	SO PO		CR-0 CB-0 ST-0	1VF	1VF TV	ST	9.0	C,S
2C2	65-85	10YR 5/3	10YR 7/4		LOAMY SAND SL	8 12	MASSIVE					CR-0 CB-0 ST-0		3VF IN	SE	8.9	
												CR- CB- ST-					
			A	0-5"	CLAY		LOAM TEXTURE					CR- CB- ST-					
												CR- CB- ST-					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	19	0	>60"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC W/ MIXING	CAMBIC	10-30"

FS 2500-1 (2/86)

RECEIVED OCT 15 2009 Oil, Gas & Mining

USDA - Forest Service

Aridic Calciustoll

COARSE-LOAMY ~~FLUVIATIC HAPLOSTOLL~~ (Refer [illegible] II 2509.18)

SOIL DESCRIPTION

UTM [illegible]

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	~~Fissity~~ (or Fi-10) mixed, super, mesic Haplustoll	9-12-06	BC		1YR9A	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
1 YEAR MINE	3 MILES SOUTH OF ALTON PRIVATE LAND		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
MIXED ALLUVIUM	ALLUVIUM FROM STRAIGHT CLIFFS		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FAN SLOPE BASIN	4	CONCAVE	75'	315°	WD → SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS + SEDGES w/ FEW SAGEBRUSH	15-17		> 7 FEET

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oe	1½-0	ROOT	MAT			2					CR-0 CB-0 ST-0			SL		
A	0-12	10YR 3/3	10YR 5/3		SANDY LOAM 8 SL 20	2M-F GR	SO	FR	SO/PO		CR-0 CB-0 ST-6	3VF 2F	3VF IN	SE	9.1	C,S
Bw	12-24	10YR 4/3	10YR 6/3		SANDY LOAM 10 22	2M-F SBK	HA	FI	SS/PS		CR-0 CB-0 ST-0	2VF 2F	2VF IN 1F-M TU	SE	9.6	C,S
Bw2	24-42	10YR 5/4	10YR 7/3		SANDY LOAM 10	2M-C SBK	HA	VFI	SS/PS		CR-0 CB-0 ST-0	2VF 1F	2VF IM 2F TU	SE	9.6	C,S
BK ~~Bg1~~	42-70	10YR 5/4 10YR 5/6	10YR 7/4 (30) 10YR 7/6 (20)	FEW FAINT 10YR 4/6	SANDY LOAM 10	MASSIVE	HA	FI	SO/PO		CR-0 CB-0 ST-0	VVF, VF	VVF-F TU	SE	9.4	A,S
2Cg 2	70-100	2.5Y 5/2	2.5Y 6/1	COMMON DISTINCT 10YR 6/6	CLAY LOAM 39	MASSIVE	SH	FR	SO/PO		CR-0 CB-0 ST-0	VVF	VF TU	NE	8.5	A S
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	10	0	> 8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	CAMBIC	10-30"

Calcic based on lab data

RECEIVED OCT 15 2009 Div. of Oil, Gas & Mining

FS 2500-1 (12/96)

SOIL DESCRIPTION

USDA - Forest Service — Fine-Loamy Calciaquoll (Ref. Soil 2509.18) — 03/11/14 — UTM 4[illegible] 714

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
6	Fine-Loamy Calciaquoll (Mixed, Superactive, Frigid)	9-12-06	BC	2 Pits	PR-R9	Alton	

9. Area	10. Forest	11. Ranger District	12. State	13. County
Mine Vein	3 mi SE Alton Private Land		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Tropic + Mixed Seds	68	None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Basin - Fanscape	1	Concave	75'	190	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Grassy Meadow w/ Sage + Rabbit Brush	15-17"		57" 56 (1 wk later)

Horizon Designation (a)	Depth (b)	Color (c) Moist (1)	Color (c) Dry (2)	Color (c) Mottling (3)	Texture (d) LAB	Structure (e)	Consistence (f) Dry (1)	Consistence (f) Moist (2)	Consistence (f) Wet (3)	Special Features (g) Cutans (1)	% of Rock Fragments (2)	Special Features (g) Roots (3)	Special Features (g) Pores (4)	Effer. Class (h)	Field pH (i)	Boundary (j)
Ag	0-6	2.5Y 4/1	2.5Y 4/2	/	Si Loam 54 22	1M GR	SO	FR	SS PS	/	CR-0 CB-0 ST-0	3c 2VF 2M 2F	3VF tu	SE	8.0	CS
Bkg ABg	6-17	2.5Y 4/2	2.5Y 5/2	/	Sandy Clay SiCL 23 27	2M-C GR	SH	FI	SS PS	/	CR-0 CB-0 ST-0	3M 2F 2VF	2VF tu	SE	8.2	AS
Bkg	17-23	2.5Y 4/1	[illegible]	Common Prominent Pale Yellow	Sandy Loam SiCL 14	2M-F SBK	HA	FI	SS PS	/	CR-0 CB-0 ST-0	1VF 1F,M	2VF TU	ST ~~SE~~	8.5	AS
BC	23-28	2.5Y 5/1	[illegible]	Many Prominent Pale Yellow	Sandy Loam SiC 16	WET	HA	FI	SS/PS	/	CR-0 CB-0 ST-0	1F,M	1VF TU	ST ~~AE~~	8.3	AS
~~BC~~ 3				Many Prominent Pale Yellow		WET					CR-0 CB-0 ST-0	1VF		NE		AS
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Partial Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
		lab 16%		

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
		Calcic	

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FS 2500-1 (2/06)

USDA - Forest Service

SOIL DESCRIPTION

(Refer to SII 2509.18) 5 (k)

Aridic ~~Ustic~~ Calciustoll

0370865 UTM 4139873

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4	Fine-loamy, mixed (or Hyperthermic) ~~Ustifluvent~~	9/18/06	BC	18-P	1YR-10	Alton	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
YR 1 Coal Mine	Super, mesic		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium + Colluvium	Mixed Sedimentary		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
Footslope	4	convex	120'		WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Juniper-Pinyon w/ Big Sagebrush	15-17"		>

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) (LAB %C)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-2" / 0-7	Cubical 10YR 3/3 10YR 3/3	Crust 1 10YR 6/3 10YR 5/3	/	SiL 26	2M-FPL 2M-F GR	SO	VFR	S/P	/	GR-0 CB-0 ST-0	3VF 2F 1M-C	3VF IN	SE	7.8	C, S
Bk	7-13	10YR 4/3	10YR 5/2	/	Loam SiL Loam 26	2M-C SBK	SO	FR	S/P	1MHDF	GR-0 CB-0 ST-0	3VF 2F 1M.C	2VF IN 1F TU	SE	7.7	C, S
Bw2 (Bt2)	13-26	10YR 4/3	10YR 6/3	/	SiC 34 23	1M-C SBK	SH	FR	SS/PS	1MDF 2M	GR-0 CB-0 ST-0	2VF 1F	2VF IN 1F TU	ST	7.9	C, W
Bk	26-44	10YR 5/3 10YR 5/6	10YR 7/3 (TS) 10YR 7/6 (ES)	/	Clay Loam SiL 34 28	2M-C SBK	HA	FI	SS/PS	/	GR-0 CB-0 ST-0	1VF	1VF-F TU	ST	8.3	C, S
Bk2 (2C)	44-68	10YR 5/3 10YR 5/6	10YR 7/3 10YR 7/4	?	Silty Clay SiL 32 26	Massive Laminar	VH	FI	SS/PS	/	GR-0 CB-0 ST-0	1VF	1VF-F TU	ST	8.5	C, S
2Ck (2C2)	68-84+	10YR 5/4 10YR 6/8	10YR 7/3 10YR 7/6	Moist Silt laminations	Sandy Loam 10 7	Massive Laminar	SO	VFR	SO/PO	/	GR-0 CB-0 ST-0	/	1VF TU	ST	8.4	
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	27	0	>8 Feet

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	~~Ochric~~ Mollic	~~Argillic~~ Cambic, Calcic	10-30"

Previous edition obsolete.

FS-2500-1 (2/86)

RECEIVED OCT 16 2006 Div. of Oil, Gas & Mining

USDA - Forest Service

Aridic Calciustoll

SOIL DESCRIPTION

(Refer to Soil 2509.18)

UTM 4138[illegible]

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
4	CO-LOAMY ~~FINE~~ ~~HAPLOBOROLL~~	9/13/04	BC	PT 22-23 LANDSCAPE	1YR-11	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW SURVEY	mixed, super, mesic	24	UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / RESIDUUM?	ALLUVIUM / DAKOTA FM		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
ALLUVIAL FAN	4	SL. CONVEX	100'	280°	MWD - WD	2	TR	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - JUNIPER -	15-17"		> 8½ FEET

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) (LAB)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A11	0-5	10YR 3/2	10YR 5/2	/	SL	9 / 12	IMPL → 1FGR	LO	FR	SO/PO	/	CR-2 CB-2 ST-0	2F-M 1VF	3VF 1N	NE	8.0	C,W
A12	5-16	10YR 3/3	10YR 5/3	/	SANDY LOAM FSL	14 / 15	1F SBK → 1M GR	SO	FR	SO/PO	/	CR-1 CB-0 ST-2	2F 1M,VF	2VF 1N 2F TU	NE	8.2	G,W
BwK1	16-32	10YR 4/3	10YR 6/3	/	SANDY LOAM	10	2M-F SBK	SH	FI	SO/PO	/	CR-2 CB-0 ST-0	1VF-F	2VF, 1F TU	SE	8.3	G,W
BwK2	32-48	10YR 5/3	10YR 6/3	/	LOAMY SAND	8	MASSIVE	HA	FI	SS/PO	/	CR-0 CB-0 ST-0	1VF	2VF, 1F TU	SE	8.3	G,W
BK	48-72	10YR 4/4	10YR 6/4	/	LOAMY SAND	5	MASSIVE	HA	FI	SS/PO	/	CR-3 CB-1 ST-0	1VF	2VF TU	ST	8.6	C,S
C	72-90	10YR 5/4	10YR 7/4	/	SAND	4	MASSIVE	SH	FI	SS/PO	/	CR-4 CB-1 ST-0	1VF	3VF 1N	ST	8.7	
												CR- CB- ST-					
												CR- CB- ST-					
												CR- CB- ST-					

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26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	13	2	>90"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CAMBIC, CALCIC	10-30"

FS 2509.1 (2/06)

USDA - Forest Service

Aridic Calciustept

SOIL DESCRIPTION (Ref. FSH 2509.18) 63-64(K) UTM

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
23	FINE, ~~SMECTITIC~~, TYPIC ~~USTOLLIC~~	9-19-06	BC	21 (P)	4YR-12	ATOW	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
MINE YEAR 1 COAL HOLLOW SOIL SURVEY	mixed, super MESIC		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
RESIDUM / COLLUVIUM	DAKOTA SS w/ TRIPIC SHALE		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
KNOLL, ERODED	8	SLIGHTLY CONVEX	75'	90°	WD	2	2	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
LOW SAGEBRUSH w/ DWARF UTAH JUNIPER + GRASSES			NONE TO 4½ FEET

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d) LAB %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 3/3	10YR 5/3	/	CLAY LOAM 22	IMPL → FGR	SO	FR	S/P	/	GR-0 CB-0 ST-0	2VF-F 2M 1C	3VF-M INFTV	NE→SE	7.8	CS
Bw	8-10	10YR 4/3	10YR 6/3	/	CLAY LOAM SICL 32	3M-F ABK	HA	FI	VS/VP	/	GR-5 CB-3 ST-0	2VF-F 1M 1C	2VF-1F TV	SE	7.8	CW
Bwk	10-26	2.5Y 5/3	2.5Y 7/2	/	SILTY CLAY SICL 44	3M-C ABK	EH	EF	VS/VP	/	GR-0 CB-5 ST-10	1VF-F	2VF TV	SE	8.4	CW
Cr	26-44	TRIPIC SHALE BEDROCK		/	SICL	3CPR MASSIVE	EH	EF	VS/VP	/	GR-0 CB-0 ST-10	1VF	1VF TV	SE	8.3	CS
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-26"	37	11	26"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	/ calcic	10-26"

based on lab data

INCORPORATED OCT 15 2008 Div. of Oil, Gas & Mining

Previous edition obsolete.

FS-2500-1 (2/06)

USDA - Forest Service

Aridic Calciustept (Reference - FSH 2509.10) 56-57(pt) WTM 4139915

1. Map Unit	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
3	Fi-loamy mixed, super, mesic ~~Aridic~~ ~~USFF Loamy~~	9-18-06	BC	49 (P)	DR-13	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
SETTLING POND YEAR 1 MINE			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM	MIXED SEDIMENTARY	68	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FANSLOPE	2	CONCAVE	125'	270°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - RABBITBRUSH	15-17		NONE TO 8 FT

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) LAB %C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 4/3	10YR 5/3	/	EMOY LOAM 21	2M-F GR	SO	VFR	SO/PO	/	GR-0 CB-0 ST-0	3VF 2F 1M	3VF-IN 1F TU	SE	8.5	A.S
BK Ac.	6-12	10YR 5/3 10YR 4/6	10YR 6/3 (80) 10YR 6/4 (20)	/	SILT LOAM 26	2M-F SBK	SH	FI	SS/PO	/	GR-0 CB-0 ST-0	3VF 2F 1M	2VF-IN 2F-M TU	SE	8.2	A.S
2BK 2C2	12-24	10YR 5/3 10YR 5/6	10YR 6/3 (85) 10YR 6/6 (15)	/	SILT CLAY 43	3F SBK	HA		S/P	/	GR-0 CB-0 ST-0	2VF 1F 1M	1VF-F-M TU	ST	8.4	A.S
2BK3 2C3	24-48	7.5YR 5/4 7.5YR 5/8	10YR 7/3 (75) 7.5YR 6/8 (25)	/	CLAY LOAM S.C.L. 32	2M-CPR → 2ABK	VH		S/P	/	GR-0 CB-0 ST-0	1F 1VF	1F-M TU	ST	8.5	A.S
2BK4 2C4	48-60	7.5YR 5/3 7.5YR 5/4	10YR 6/4 (75) 7.5YR 6/4 (25)	/	CLAY LOAM S.C.L. 28	2M-C ABK	VH		S/P	/	GR-0 CB-0 ST-0	1VF	1VF-F TU	ST	8.8	A.S
C1	60-72	10YR 4/3 10YR 4/6	10YR 5/4 (80) 10YR 5/6 (20)	/	SANDY LOAM 24	MASSIVE	VH		S/P	/	GR-0 CB-0 ST-0	/	1VF-F TU	ST	8.9	A.S
C2	72-84 84+	10YR 5/3 10YR 5/6	10YR 7/3 (60) 10YR 6/6 (40)	/	LOAM 20 8	MASSIVE	SO	FR	SO/PO	/	GR-0 CB-0 ST-0	/	2VF IN	ST	8.7	
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	33	0	> 8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	/	10-30"

Div. of Oil, Gas & Mining
OCT 15 2009
INCORPORATED

Previous edition obsolete.

FS-2500-1 (2/86)

USDA - Forest Service

Aquic Cryoxerept

SOIL DESCRIPTION

(Refer to FSH 2509.18)

UTM 4139772

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
6	Fi-Lomy ~~Aquic Ustifoliist~~ ~~Aquoll~~	9-13-00	BC	PEY 25-27	SP14	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow	mixed, super, frigid		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Alluvium / Residuum		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Basin	1	Concave	100'	350°	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Grass + Sedges	15-17"		90-100"

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/2	10YR 5/3	No	Silt Clay	44	2M-F GR	SO	FR	SS/P	/	CR-0 CB-0 ST-0	3VF 3F 1M	3VF IN	NE	8.7	C,S
Bwk A2	6-13	7.5YR 4/4	7.5YR 5/4	No	Silty Clay	44	1F SBK	VH	VFI	SS/P	/	CR-0 CB-0 ST-0	2VF 2F 1M	2VF TU	SE	7.8	C,W
2Bwk ~~2ET~~	13-28	10YR 6/4	10YR 7/3	begined 24"	Clay Loam Sicl	37	2M-F SBK	HA	FI	SS/PS	/	CR-0 CB-0 ST-0	1VF	1VF TU	SE	8.1	G,W
2Bwk 2C2	28-48	10YR 7/2	10YR 6/3	Yes	Loam	17	2F SBK	HA	VFI	SO/PO	/	CR-0 CB-0 ST-2	1VF	1VF TU	ES	8.7	G,S
3Cg 1	48-70	10YR 5/3 10YR 6/6	10YR 7/2 (60) 10YR 7/6 (40)	Faint indistinct Yes	Silt Clay Loam	39	Massive	HA	VFI	SO/PO	/	CR-0 CB-0 ST-0	/	1VF-1F TU	ES	8.8	A,S
3Cg 2	70-90	10YR 5/4	10YR 6/3	Many distinct Yes 10YR 6/8	Silt Clay Loam	32	Massive	VH	VFI	S/P	/	CR-4 CB-0 ST-0	/	1VF TU	SE	8.5	
												CR- CB- ST-					
												CR- CB- ST-					
												CR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	24"	3	>90"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	—	10-30"

lab data shows calcic

INCORPORATED
OCT 15 2000
Division of Oil, Gas & Mining

FS 2609.1 (2/96)

6 SAMPLES COARSE-LOAMY ~~EUTRIC~~ ~~HAPLOSTOLL~~ (Reference FSH 2509.18) 61-62 (V) 1 UTM

1. Map Unit	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	~~FINE-SILTY~~ mix, super, mesic ~~HAPLOSTOLL~~	9-19-86	BC	21 P	SP-15	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
SETTING PONDS COAL HOLLOW SOILS SURVEY			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / RESIDUUM	MIXED SEDIMENTARY		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
BASIN	2	UNIFORM	75'	260°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS - SEDGES w/ LOW SAGEBRUSH	15-17 INCHES		NONE TO 8½ FEET

HORIZON DESIGNATION (a)	DEPTH (INCHES) (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	% C.	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
OE	1-0	DENSE ROOT MAT										GR - CB - ST -			NE		A, S
A	0-8	10YR 3/3	10YR 5/3	/	SILT ~~LOAM~~ SANDY LOAM	16 21	2M-C GR	SO	FR	SS/PO	/	GR - 0 CB - 0 ST - 0	3VF 3F, M	2VF IN	SE/NE	8.0	A, S
Bw[k]	8-20	10YR 4/4	10YR 6/3	/	SIL LOAM	18 26	2M-F SBK	HA	FI	S/P	/	GR - 0 CB - 0 ST - 0	2VF-F IM	3VF IN 2F TN	~~NE~~ ~~SE~~ ST	8.5	A, W
Bk1	20-37	10YR 5/3 10YR 5/6	10YR 7/3 10YR 7/4	/	FSL → SIL LOAM	15 26	3M-C SBK	VH	VFI	S/P	/	GR - 0 CB - 0 ST - 0	2VF 1F, M	1VF-1F TN	ST ~~SE~~	8.7	A, S
Bk2	37-58	10YR 5/4	10YR 7/3	~~CALCIUM MATTER~~	LOAM SIL	18 23	2M-C SBK	SH	FI	S/P	/	GR - 0 CB - 0 ST - 0	1VF-1F	1VF-TN	ST ~~SE~~	8.6	A, W
C1	58-73	10YR 5/4 10YR 5/8	10YR 6/4 10YR 6/6	COMMON PROMINENT	SL	8 15	MASSIVE	SO	VFR	SO/PO		GR - 0 CB - 0 ST - 0	1VF 1F	/	VE ~~NE~~	8.4	A S
C2	73-96	10YR 5/4 10YR 5/8	10YR 7/3 10YR 7/6	COMMON PROMINENT	SL	14	MASSIVE	SO	FR	SO/PO	/	GR - 0 CB - 0 ST - 0	/	/	VE ~~NE~~	8.3	
												GR - CB - ST -					
												GR - CB - ST -					

26. Particl Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	16	0	> 9 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CAMBIC CALCIC	10-30"

Previous edition obsolete. FS-2500-1 (2/86)

Div. of Oil, Gas & Mining
OCT 15 1986
INCORPORATED

USDA - Forest Service

Aquic Calciustoll SOIL DESCRIPTION

FINE-LOAMY ~~FINE~~ ~~CALCIUSTOLL~~ (Reference FSH 2509.18) 59-60 K

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
6	~~FINE-SILTY~~ (or FI-LO) mixed, super, mesic ~~LIMESTONE~~	9-19-04	BK	20-P	SP-16	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
SETTLER PONDS (COAL HOLLOW)			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM / RESIDUUM	ALLUVIUM MIXED SEDIMENTARY		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
BASIN	1-2	CONCAVE	160'	310	WD	2	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS + SEDGES	5-17"		> 8 FEET

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	% C.	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oe	1½-0	DENSE ROOT MAT.									/	GR - 0 CB - 0 ST - 0			NE		A.W
A1	0-8	10YR 3/2	10YR 4/2		SILTY CLAY LOAM	36	3M-F GR	SO	FR	S/P	/	GR - 0 CB - 0 ST - 0	3VF 3F 3M	3VF 3F 3M	NE	8.3	C.S
Bw A2	8-18	7.5YR 5/6	10YR 6/2	/	SILT LOAM	44 28	2F SBK → 2GR	SH	FR	S/P	/	GR - 0 CB - 0 ST - 0	2VF-F 2M 1C	2VF-F 2M 1C	NE	8.2	C.S
Bw1	18-36	7.5YR 5/4	7.5YR 7/3	/	CLAY LOAM SIL	28 27	3M-F ABK	VH	VFI	S/P		GR - 0 CB - 0 ST - 0	2VF 2F	2VF 2F	SE	8.7	A.S
Bw2	36-56	7.5YR 5/4	7.5YR 7/4	FEW FAINT 7.5YR 5/6	SILTY CLAY SIL	28 29	2MC SBK	HA	FI	S/P	/	GR - 0 CB - 0 ST - 0	2F 1VF	2VF 1VF	SE	9.0	A.S
2Cg1	56-68	7.5YR 5/4 7.5YR 5/6	7.5YR 7/3 7.5YR 7/4	FEW FAINT 7.5YR 4/6	LOAM SIL	14 27	MASSIVE	HA	FI	S/P	/	GR - 0 CB - 0 ST - 0	1VF-F	1VF-F	SE → NE	8.9	A.S
2Cg2	68-96	2.5Y 5/2	2.5Y 6/2	COMMON PRAMIN 5YR 5/6	SCL → SIL	28 30	MASSIVE	HA	VFI	SS/PS	/	GR - 0 CB - 0 ST - 0	1F 1VF	1F 1VF	NE	8.9	
					CLAY LOAM							GR - CB - ST -					
												GR - CB - ST -					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	31	0	> 8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	CAMBIC calcic	10-30"

Previous edition ... lete. FS-2500-1 (2/86)

does not make Aquic Calciustoll because mottles are deeper than 30"

INCORPORATED OCT 15 2004 Div. of Oil, Gas & Mining

USDA - Forest Service

SOIL DESCRIPTION

(Refer to FSH 2509.18)16-17(P)

Aridic ~~Ustic~~ Calciustoll

UTM 414064

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4	Fine-Loamy ~~Argiustoll~~	9-18-06	BC	53-54 (V)	WRD-17	Acton	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
Waste Rock Dump Coal Hollow Survey	2½ mi. SE of Acton		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium + Colluvium	Mixed Sedimentary		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
Footslope	3	Planar	200'	210°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
WTO Big Sagebrush - Rabbitbrush W/ P.J.	15-17"		None TO

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (4)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/3	10YR 5/3		Clay Loam Silt 36 28	3 m-cpl Fgr	So	Fr	S/P		GR - 1 CB - 0 ST - 0	3vf 2f,m 1c	3vf in 1f tu	SE	7.8	C,S
Bw	9-18	10YR 4/3	10YR 6/3		Clay Loam Silt 32 30	2m-f ABk	Vh	Vf	S/P	2mk RF, 1mpo	GR - 2 CB - 0 ST - 0	2vf 1f 1m 1c	1vf-f tu	SE	8.0	C,S
Bk	18-30	10YR 4/3 10YR 5/8	10YR 6/4 (70) 10YR 6/6 (30)		Loam Silt 22	3m-f ABk	Vh	Vfi	S/P	2mkpf 1mpo	GR - 2 CB - 0 ST - 0	1vf 1f,m	1vf-f tu	SE	8.0	C,W
Bk	30-45	10YR 4/4	10YR 6/3		Clay Loam Silt 27	3m-f ABk	Mh	Vfi	S/P	2mpo 1mpf	GR - 2 CB - 0 ST - 0	1f,vf	1f-m tu	4vf CaM ST	8.1	G,W
Bk	45-60	10YR 5/4 7.5YR 5/6	10YR 7/3 7.5YR 6/6	Blue colors from LMS	Clay Loam Silt 32	3m-c SBk	Sh	Fi	S/P		GR - 2 CB - 0 ST - 0	1vf	1vf-f tu	8vf CaM	8.2	G,W
Bk	60-80+	7.5YR 5/4 7.5YR 5/6	10YR 7/4		Silty Clay 40						GR - 0 CB - 0 ST - 0		2vf-1f tu	ST 6vf CaM	8.0	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	26	0	>60 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	Argillic + Calcic	10-30"

Previous edition obsolete.

FS-2500-1 (12/86)

RECEIVED OCT 15 2009 Div of Oil, Gas & Mining

USDA - Forest Service

SOIL DESCRIPTION

(Ref. SII 2509.18)

0371878

UTM 4140230

FINE-LOAMY Typic Argiaquoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
E7	~~FINE-LOAMY TYPIC CALCIAQUOLL~~ mixed, super, frigid	9/14/06	BC	32-33 (K)	WRO 18A	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW STUDY AREA	PRIVATE LANDS 2 MILE SE OF ALTON		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion:
ALLUVIUM / RESIDUUM	ALLUVIUM & TRIASSIC SILTSTONE		a. Kind NONE b. Class

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
FANSLOPE	a. % 4 b. Shape CONCAVE c. Length 250' d. Aspect 250°	SPD	a. GR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
GRASS + SEDGE FEW ARTR ROCKY MTN IRIS	15-17"		51" (53 IWH)

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) (LAB %)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-7	10YR 3/2	10YR 5/2	/	SIL LOAM 26	1FSBK → MG	SO	FR	SS/PS	/	CR-0 CB-0 ST-0	3VF 3F 3M	3VF 1N	SE	7.7	A,S
Bw	7-15	10YR 4/3	10YR 6/3	Common FAINT	SIL LOAM 24	2FTM SBK	SO	FR	SS/PS	/	CR-0 CB-0 ST-0	2M-F 3VF	2VF-1F 1N	me ~~SE~~	8.0	A,S
BK1 ~~Ag~~	15-30	2.5Y 5/3	2.5Y 7/3	Common FAINT	FSL 17 SIL 47	2M-F SBK	SO	FR	SS/PO	/	CR-0 CB-0 ST-0	2M 1F 1VF	1VF TU	ST ~~SE~~	8.1	A,S
2BtK ~~Ag2~~	30-45	2.5Y 5/2	2.5Y 6/2	MANY PROMINENT	CLAY LOAM SIL 35	2FSBK → MGR	SH	FI	SS/PS	35 CLF PF /	CR-0 CB-0 ST-0	2M 1F 1VF	1VF TU	ST ~~SE~~	8.0	A,BW
2Cg ~~Ag~~	45-60	5Y 5/2	5Y 6/2	GLEYED	SANDY CLAY SIL 20	MASSIVE				/	CR-0 CB-0 ST-0	1M 1F	1F TU	VE UNDER WATER	7.9	A
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	27	0	>60"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	CALCIC	10-30

Div. of Oil, Gas & Mining
OCT 15 2008
INCORPORATED

FS 2500-1 (2/96)

USDA - Forest Service

SOIL DESCRIPTION

(Refer to FSH 2509.18)

Typic Argiaquoll

UTM 4140300

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4	Fine-loamy, mix, super, frigid, calcareous	9-14-06	BC	34-35	WRO-18B	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COOL HOLLOW SOIL SURVEY	APPROX 2 MILE SE OF ALTON		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM / ALLUVIUM	MIXED SEDIMENTARY		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
ALLUVIAL FANS LOPE	3	CONVEX	150'	220°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
WYO BIG SAGEBRUSH RABBITBRUSH	15-17"		>8 FEET

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) (LAB %C)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/4	10YR 5/4	/	SiL LOAM 26	2M-F SBK	SO	FR			CR-0 CB-0 ST-0	2M 2C 1VF,F	3VF IN	SE	8.2	C,S
Bt1 ~~Bw~~	9-19	10YR 4/3	10YR 6/3	/	SiL LOAM 20	2M-C SBK	SH	FI		/	CR-1 CB- ST-	1F,M 1VF,C	2VF-1F IN	SE	8.3	C,W
Bk1	19-34	10YR 5/4	10YR 7/3	/	LOAM SiCL 18	2M-F SBK	VH	VFI	S/P	1 ~~CARP~~ 2 ~~MAP~~	CR-2 CB- ST-	1VF,F	1VF-1F TU	SE	8.5	C,W
Bk2	34-54	10YR 5/4	10YR 6/3		CLAY LOAM SiC 32	2M-C ABK	VH	VFI	S/P	~~1 CARP~~ ~~CARP~~	CR-2 CB- ST-	1VF	1VF TU	SE	8.7	C,W
Ck	54-72	10YR 4/4	10YR 6/4	/	CLAY LOAM SiC 34	MASSIVE	VH	VFI	S/P	/	CR-1 CB- ST-	V,1VF	1VF TU	SE	8.6	C,W
C	72-96	10YR 5/4	10YR 6/3	/	LOAM 20	MASSIVE	EH	~~VF~~-I	S/P	/	CR-1 CB- ST-	/	2VF TU	VS	8.6	
											CR- CB- ST-	/		~~VS~~		
											CR- CB- ST-					
											CR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	25	0	>8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	~~ARGILLIC~~ / CAMBIC	10-30

UNCONFIRMED
OCT 15 2009
Div of Oil, Gas & Mining

FS 2500 1 (2/86)

USDA - Forest Service

Calcic ~~Typic~~ Argiustoll

SOIL DESCRIPTION (Reference FSH 2509.18) Photos 39-40-41 UTM 4130048

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
4	Fi-Loamy ~~Fine~~ mixed, super, mesic ~~Argiustoll~~	9/14/06	BC	39, 40	WRD-19	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW SOIL SURVEY	WEATHER STATION TO EAST 9/17/06		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM / RESSIDUM	DAKOTA FORMATION	700	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FAN SLOPE	5	CONVEX	250'	260°	WD → SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH - RABBITBRUSH, SCATTERED JUNIPER	15-17"		NONE

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
P	0-6	10YR 3/2	10YR 5/2	/	Loam SCL	27	2M GR	SO	FR	SS/PS	/	CR-0 CB-0 ST-0	3VF 1F,1M	3VF IN	SE	8.0	C,S
Bt1	6-12	10YR 4/2	10YR 5/3	/	Clay Loam SCL	29	2M-F SBK	HA	F1	SS/PS	1APO	CR-0 CB-0 ST-0	1VF-F	1VF-1F TU	SE	8.2	C,W
Bt2	12-24	10YR 4/4	10YR 6/3	/	Clay Loam SCL	32	2F-M SBK	VH	VF1	S/P	2MKPF 1APO	CR-0 CB-0 ST-0	1VF-F	1VF-1F TU	4VFCAM ST	8.3	C,W
Bt3	24-37	10YR 4/3	10YR 6/3	/	Loam CL	34	3F-M SBK	HA	VF1	S/P	1M PF/PO	CR-0 CB-0 ST-0	1F	1VF-1F TU	8FCAM ST	8.5	C,W
Bu1	37-51	10YR 4/4	10YR 6/4	/	FINE SL	19	2M-C SBK	HA	VF1	SS/PO	/	CR-0 CB-0 ST-0	1F, 1M	1VF TU	ST 4FCAM	8.4	C,S
Bu2	51-68	10YR 5/4	10YR 6/3	/	Sandy Loam	17	MA	HA	F1	SO/PO	/	CR-0 CB-0 ST-0	1F, 1M	2VF 1F TU	VE 6FCAM	8.5	C,W
BK3	68-90	10YR 5/4	7.5YR 6/4		Sandy Loam	10	MA	LO	LO	SO/PO	/	CR- CB- ST-	/	3VF IN	ST 6FCAM	8.7	
												CR- CB- ST-					
												CR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	12-32"	31	0	>6 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	ARGILLIC, calcic	10-30"

INCORPORATED OCT 15 2006 Div. of Oil, Gas & Mining

FS 2509.1 (12/96)

USDA - Forest Service CO-loamy, Mixed Calciustoll SOIL DESCRIPTION (Reference FSH 2509.18) 44-46 K UTM 037 1990 4140480

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
8	CO-loamy, mix, super, mesic	9-17-06	BC	6-7 (P)	WRD 20		

9. Area	10. Forest	11. Ranger District	12. State	13. County
WATERDOWN STAKE OAK HOLLOW SOIL	SUNDANCE	NFS LANDS 2 MI SE OF ARTON	UT	FRN

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM	MIXED SEDIMENTARY	70	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FANSLOPE	3	CONVEX	75'	190°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
OAK-SNOWBERRY w/ ASPEN PINYON JUN. PER	17-19		>6 FT

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/3	10YR 5/3	/	LOAM	24	2M-F GR	SO	FR	SS PS		GR - CB - ST -	3-F 2F 2M-C	3VF-IN	SE	7.9	C, S
BW	6-13	10YR 4/4	10YR 6/4	/	SICL / CLAY LOAM	30 / 22	2M-F SBK	HA	FI	SS PS	/	GR - TR CB - C ST - O	2M-C 2F 1VF	2VF-1F TU	SE	7.8	C, S
BK	13-28	10YR 5/4	10YR 6/3	/	SANDY LOAM SCL	17	3M-C SBK	VH	FI	SO PO	/	GR - CB - ST -	2M-C 1F, VF	1VF-1F TU	ST	8.1	A, S
CK 2C	28-54	10YR 5/4	10YR 7/4	/	LOAMY SAND LS	12	1CSBK → SG	SO	VFR	SO PO	/	GR - 10 CB - 3 ST -	2VF 1F, M 1C	1VF TU	ST	8.0	A, S
3C1	54-72	7.5YR 5/6	7.5YR 6/4	/	LOAM CL	31	MASSIVE	SH	FI	SS PS	/	GR - 0 CB - ST -	1F-M	1VF-1F TH	ST	8.1	C, Kw
OE	3-1½	OAK LEAVES TWIGS, BRANCHES										GR - CB - ST -					
O1	1½-0	SLIGHTLY DECOMPOSED LITTER			FOREST							GR - CB - ST -					
3C2	72-96	10YR 4/3	10YR 6/3	/	LOAMY SAND	5	MASSIVE	LO	LO	SO/PO	/	GR - CB - ST -	1VF	1VF IN	SE	8.2	
												GR - CB - ST -					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	13	0-2%	>96 INCHES

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	~~ARGILLIC~~ CALCIC	10-30"

Previous edition obsolete. FS 2500-1 (2/86)

+ LENSE OF GRAVELLY ALLUVIUM 35-40"

RECEIVED OCT 15 2009 Div. of Oil, Gas & Mining

USDA - Forest [redacted] Arido Calcisol SOIL DESCRIPTION

COARSE-LOAMY ~~Mixed~~ ~~USTIFLUVENT~~ (Reference: FSH 2509.18) 47-48 (K) UTM 4140354

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
8	mix, super, mesic ~~Fr-Loamy~~ ~~Hyperthermic~~	9-18-06	BC	8-9 (P)	WRD-21	ALTON	Sec. ___ T. [redacted] R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
Waste Rock Dump			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Mixed sed Mentary	7[illegible]	None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Fan Surface	2	Plane	100'	191°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Big Sagebrush Opening in Oak Grove	17-18"		None

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	7.5YR 4/4	7.5YR 6/4	/	Sandy Loam 28 19	2m-c SBK → PL	SO	VFR	SO PO	/	CR-0 CB-0 ST-0	3VF 2F,M 1C	2VF-2F IN	VS → EO	8.4	C,S
BwK	8-18	7.5YR 4/3	7.5YR 6/3	/	Sandy Clay Loam 30 28	2M-F SBK	VHA	VFI	S PS	/	CR-0 CB-0 ST-0	2VF-F 1M,C	1VF-F, 1M TU	ST	8.1	C,W
BwK2	18-36	7.5YR 4/4	7.5YR 6/3	/	Sandy Loam SCL 21	2M-F SBK	SH	FI	SS PS	/	CR-5 CB-1 ST-0	1M,F 2VF	1VF TU	ST	8.4	C,W
BwK3	36-50	7.5YR 5/4	7.5YR 6/3	/	SL 8 16	3 m-c SBK	SH	VFR	SO PO	/	CR-0 CB-Tr ST-0	1VF	1VF TU	SE	8.7	C,S
2C1	50-62	10YR 4/4	10YR 6/3	1F	SL 8 14	Massive	HA	FI	SO PO	/	CR-0 CB-0 ST-0	/	1VF-F TU	SE	8.7	C,S
2C2	62-46+	10YR 5/4	10YR 7/3	2 common distinct	Loamy Sand 12 6	SG	LO	LO	SO PO	/	CR- CB- ST-	/	3VF 1F TU	SE	8.7	C,W
				7.5YR 4/6							CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

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26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	8-18	15	2	>8 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Ochric	~~Argillic~~ Calcic Cambic	10-30"

FS 2509.18 (12/96)

USDA - F[illegible] | Fo[illegible] | **SOIL DESCRIPTION** (Refer [illegible] 11 2509.18) | WRD-22 UTM | 0372253 4142382

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
8	Fi-loamy Typic Haplustalf	9-14-06	BC	36-37	WRD-22	ALTON	

9. Area	10. Forest	11. Ranger District	12. State	13. County
Goal Hollow Soil Survey	~ 2½ mi SE of Alton		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Residum Colluvium over	Tropic / Dakota Residuum		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
Toeslope	8	convex	75	220°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Oak, Snowberry, Grasses, Forbs			7 ft

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d) LAB	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
Oe	7-4	Oak leaves, duff, twigs														
O1	4-0	Partially decomposed oak leaf litter														A, S
A	0-6	10YR 5/4	10YR 6/3	/	Sandy clay loam 14	2m-f SBK	SH	vFR	SO/PO	/	CR-0 CB-0 ST-0	2m 2f 1vf	1vf-f 1n	SE	7.7	A, S
Bt1	6-15	10YR 4/3	10YR 6/4	/	Silty clay loam 34	2m-c SBK	HA	FI	S/P	1mkpf	CR-0 CB-0 ST-0	2m 2f 1c 1vf	1vf-f Tn	SE	7.7	C, S
Bt2	15-28	10YR 4/4	10YR 6/4	Few faint root channels	Sandy clay loam 26	2m-f SBK	HA	FI	SS/PS	2mpo	CR-0 CB-0 ST-0	1f 1m 1c	1vf Tn	SE	8.0	C, S
Bk1	28-48	10YR 5/4	10YR 7/4	Few faint	Sandy loam 14	3m-c SBK	HA	FI	SO/PO	/	CR-0 CB-0 ST-0	1f 1m 1c	1vf-f Tn	SE	8.0	C, W
Bk2	48-60	10YR 5/4	10YR 6/3	Common prominent	Sandy loam 14	Massive	SH	FR	SO/PO	/	CR-0 CB-0 ST-	1m 1f 1c	2vf Tn	SE	8.0	C, W
C	60-84	10YR 5/4	10YR 7/3	Many prominent	Sandy loam 8	Massive	SH	FR	SO/PO	/	CR- CB- ST-	1vf-f 1m,c	3vf 1n	SE	8.2	
											CR- CB- ST-					

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	6-28	25	0	84" +

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Ochric	Argillic	10-30"

** Redox mottles not present in box sample. **

Div. of Oil, Gas & Mining
OCT 15 2009
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USDA - Forest Service

SOIL DESCRIPTION

Aridic ~~Pale~~ Calciustoll (Ref. Soil Taxonomy 2509.18) 42, 43 Kanab UTM 41405

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
74	Mix, super, mesic FINE-LOAMY ~~ARGI~~USTOLL	9-17-09	BC	45(P)	WRD-23	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COralDale Soil Survey	NE EDGE OF SURVEY AREA		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
SEDIMENTARY	MIXED COLLUVIUM		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FANSLOPE	3	CONCAVE	130'	200°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH, SCATTERED JUNIPER, GRASSES	15-17"		NONE

HORIZON DESIGNATION (a)	DEPTH (b) (inches)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (4) LAB	STRUCTURE (5)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/2	10YR 5/2		(LOAM) SIL 31	2MGR	SO	FR	SO PO		CR - CB - ST -	3VF 2F, M 1C	3VF IN	SE	7.7	K, S
NB	6-12	10YR 4/3	10YR 6/4		SICL 31 27	3M-F SBK	HA	FI	S PS		CR - CB - ST -	2VF 1F 1M, C	2VF IN 1F TU	SE	7.9	C, W
Bk1	12-22	10YR 5/4	10YR 6/3		CLAY LOAM CL 28 30	2F SBK	HA	FI	S PS		CR - CB - ST -	2VF 1F, M	3VF-1F TU	ST	7.9	C, S
Bk2	22-40	10YR 5/4	10YR 6/3	1 FAINT 10YR 4/6	LOAM SCL 19 20	2M-C SBK	HA	VFI	SS PO		CR - CB - ST -	1VF-1F	1VF-F TU	ST	8.0	C, W
CK	40-62	7.5YR 5/4 7.5	10YR 7/4	1 FAINT 10YR 7/6	(LOAM) SCL 25 22	2M-C SBK	HA	VFI	SS PS		CR - CB - ST -		2VF TU	ST	8.2	G W
2C2	62+80	7.5YR 5/4 7.5YR 6/8	7.5YR 7/3 7.5YR 6/4	3 FAINT 7.5YR 7/4	SILTY CLAY 41	MASSIVE AUGER REF	VH	VFI	S/P		CR - CB - ST -		2VF TU	ST	8.1	
											CR - CB - ST -					
											CR - CB - ST -					
											CR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	6-22	28	0	> 80 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC	ARGILLIC, CALCIC	10-30"

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FS 2500-1 (2/86)

USDA - Forest Service

Aridic (Haplustoll)

SOIL DESCRIPTION

(Refer to FSH 2509.18) DAH-24 UTM 4139690

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo No.	6. Stop No.	7. USGS Quad	8. Location:
~~SA~~ 5	Fine ~~(calcareous), mixed~~, super, mesic ~~Ustorthents~~	9-15-06	BC	28-29	DAH-24	ALTON	Sec. ___ T. ___ R. ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
CORE HORIZON SURVEY	MODERATELY DEEP		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
COLLUVIUM / RESIDUUM	DAKOTA FM / UP TRIASSIC	68	NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
HILLSLOPE	13	CONVEX	50'	20°	PD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PINYON-JUNIPER W/ BLACK SAGEBRUSH	15-17"		NONE

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
A	0-5	2.5Y 4/2	2.5Y 4/3	/	CLAY 47	1FSBK → MGR	SO	VFR	S/VP	/	CR-0 CB-0 ST-0	2VF 1F,M,C	2VF-1F IN	NE	7.6	C,W
Bw1	5-17	2.5Y 4/3	2.5Y 4/2	/	CLAY 44	2M-F SBK	EH	EF	VS/VP	/	CR- CB- ST-	1VF 1F	1VF TU	NE	7.7	C,W
Bw2 C2	17-32	5Y 5/3	5Y 5/4 5Y 6/2	/	CLAY 45	3C-M ABK	EH	EF	VS/VP	/	CR- CB- ST-	1VF	1VF TU	NE	8.1	A,W
Cr	32-60	GREY SILTSTONE / SANDSTONE BEDROCK									CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-32	50+	0	32" TO SOFT SHALE

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	—	10-32"

INCORPORATED OCT 11 2006 Div. of Oil, Gas & Mining

USDA - Forest Service

fine mix super Aridic ~~Calciustept~~

SOIL DESCRIPTION (Reference: NSSH 2509.18) Landscape 31 PIN 413 9852

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
5	mesic ~~CLAYSHALE TYPIC USTOCHREPTS~~	9-13-06	BC	30	DAH-25	ALTON	Sec. ___ T. ___ R ___

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW SOIL SURVEY	MODERATELY DEEP		UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
RESIDUUM	DAKOTA FM - HARD SANDSTONE	69	SLIGHT SHEET	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
HILLSIDE	19	CONVEX	50'	140°	SPD	20	15	2	TR

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PINYON-JUNIPER WITH FEW SAGEBRUSH	15-17"		None

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	LAB TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	LAB FIELD pH (i)	BOUNDARY (j)
O1	1/2-0	NEEDLES, DISCONTINUOUS		~~NONE~~		2F SBK	~~HA~~	~~FI~~	S/P	/	CR-25 CB-15 ST-0	1VF 4F 2MTK		NE		
A	0-5	7.5YR 3/3 7.5YR 4/4	7.5YR 5/2 7.5YR 6/4	NONE	CLAY 40	2M-F SBK	HA	FI	S/P	/	CR-15 CB-15 ST-0	1F 1M 1C	2VF IN 1F TU	NE	6.4	C,S
BK1 C1	5-13	7.5YR 4/2	7.5YR 5/2	NONE	CLAY 47	2M SBK	HA	FI	VS/VP	/	CR-20 CB-10 ST-0	1VF, F 1M	1VF-F TU	NE	7.0	C,W
BK2 C2	13-20	10YR 3/4 7.5YR 5/6	10YR 4/3	NONE	SANDY CLAY 46	2M SBK	HA	FI	VS/VP	/	CR-0 CB-10 ST-10	1VF	1VF TU	NE	7.2	C,W
C3	20-32	10YR 4/4	10YR 5/4	/	SANDY CLAY 33	3M-F ABK	VH	FI	VS/VP	/	CR- CB- ST-	1VF	2VF TU	SE	7.7	C,S
R	32+	HARD SANDSTONE BEDROCK									CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					
											CR- CB- ST-					

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26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-32"	45	>35%	32" HARD SANDSTONE

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	OCHRIC	—	10-30"

SS-2509.1 (2/86)

BK based on lab data - but no effervescence in box sample

USDA - Forest Service

SOIL DESCRIPTION

Aquic Calciustoll (Hopkins) (FSH 2509.10)

0371545 4140492

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
1	Fine ~~Smectitic~~ ~~Typic Haplustoll~~ mixed, super frigid	9-15-05	BC		26		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Fish Springs			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium - Residuum	Tropic Shale			

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Footslope	3	Convex	125'	Zero	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Juniper w/Sagebrush	5-16"		Not in Pit

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 3/3	10YR 5/3	/	SiCL	1MPL → FGR	SO	FR	SS/PO	/	GR: 0 CB: 0 ST: 0	3VF 1FM	3VF IN	SE		C,S
Bw C1	8-20	2.5Y 4/3	2.5Y 6/3	/	SiCL	2c-M ABK	HA	VFI	VS/VP	/	GR: 1 CB: 2 ST: 0	1F,M 1VF	1VF-F TU	SE		C,S
Bwk C2	20-50	2.5Y 4/3	2.5Y 6/2	2fm 7.5YR6/6	SiCL	3m-c NBK	EH	VFI	VS/VP	/	GR: 2 CB: 2 ST: 0	1VF 1F	1VF-F TU	ST		GRW
Bwk C3	50-80	2.5Y 5/2 10YR 6/6	2.5Y 6/3 (80) 10YR 7/6 (20)	7.5YR6/6	SiCL	3m-c NBK	EH	VFI	VS/VP	/	GR: 2 CB: 2 ST: 0	/	1VF TU	ST		GRW
2 BK1 2C4	80-105	2.5Y 5/2	2.5Y 6/2	1f 7.5YR6/6	CL	Massive	HA	EFI	VS/VP	/	GR: 2 CB: 0 ST: 0	/	2VF TU	SE		
2 Bk2 2C5	105-125	10YR 5/3 10YR 5/6	10YR 6/3 10YR 6/6	3fm 7.5YR6/6	LOAM	Massive	SO	FR	SS/PS	/	GR: 0 CB: 0 ST: 0	/	2VF IN 1F TU	SE		
											GR: CB: ST:					
											GR: CB: ST:					
											GR: CB: ST:					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35	3	>125"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	Calcic	10-30"

Previous edition obsolete.

FS 2500-1 (2/06)

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USDA - Forest Service

Aridic ~~Ustic~~ ~~Xeric~~ CALCIUSTOLL DESCRIPTION (Reference FSH 2509.10)

037:387 4/79/27

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
1	Fine ~~Sandy~~ mixed, super, mesic ~~Loam~~	1/13/04	BL		27		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow Soil Survey			Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Backhoe pit		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Footslope and fanslope	3	Convex	250'	270°	WD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Sagebrush - Rabbitbrush, grasses			None

HORIZON DESIGNATION (a)	INCHES DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 4/2	10YR 5/2	/	SiCL	2m-f SBK	HD	FI	SS/PS	/	GR: 0 CB: 0 ST: 0	VF, 2F, 2M	2VF-IN 2F TU	SP		G, S
BW	8-17	2.5Y 5/3	2.5Y 6/2	/	CL	2m-SBK	VH	VFI	S/VP	/	GR: 0 CB: 0 ST: 0	IVF IM 2F	IVF-F TU	VE		G, W
BWK	17-38	2.5Y 4/3	2.5Y 6/3	/	CLSi	2c-m ABK	VH	EFI	VS/VP	/	GR: 0 CB: 0 ST: 0	IF IM IVF	IVF TU	ST		G, S
BWK	38-65	2.5Y 5/3	2.5Y 6/2	/	CLSi	3cPR ABK	EH	EFI	VS/VP	/	GR: 0 CB: 0 ST: 0	IVF, F IM	IVF TU	ST		C, S
2BK1	65-90	10YR 5/3 10YR 5/6	10YR 6/2 10YR 6/4	(70) (30)	LCM	MASSIVE	HD	VFI	SS/P	/	GR: 0 CB: 0 ST: 0	IVF	2VF-IF TU	ST		A S
2BK2	90-115	10YR 5/4	10YR 7/3	FEW FAINT	LS	MASSIVE	HD	FR	SO/PO	/	GR: 0 CB: 0 ST: 0	/	3VF IN	VE		Mottled Mottled
3BKG	115-140	7.5YR 5/4	7.5YR 6/4	3% DISTINCT	LFS	SG	SH	FR	SO/PO		GR: 0 CB: 0 ST: 0	/	3VF IN	VE		Mottled Mottled
		5YR		YB							GR: CB: ST:			VE		
											GR: CB: ST:					

26. Partial Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35	0	>140"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Ochric	Calcic	10-30"

INCORPORATED OCT 15 2004 Div. of Oil, Gas & Mining

Previous edition Note.

FS 2500-1 (2/86)

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18) UTM 0371447 4140523

Aridic Calciustept

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. T. R.
11	Fine mixed, super, mesic ~~Typic Ustorthents~~	11/15/06	BC		28		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Eure Harrow	Bacchus		UT	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium-Colluvium	Tropic Shale		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Footslope	5	Concave	300'	260	SPO	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Grass Rabbitbrush (Seeded)	15-16		None

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 4/2	2.5Y 5/3	/	SiC	2m-F GR	HA	FI	S/P	/	GR-0 CB-0 ST-0	2VF 1F	2VF IN 1F TU	ST		G,S
BW	8-24	2.5Y 5/2	2.5Y 6/1	/	CLAY	2m-C SBK	VH	VFI	VS/VP	/	GR-0 CB-0 ST-0	1VF 1F	1VF-F TU	ST		G,W
BwK C2	24-48	2.5Y 5/3	2.5Y 6/1	/	CLAY	3c-PR → 3BK	VH	VFI	VS/VP	/	GR-2 CB-0 ST-0	/	1VF-F TU	2FCAM ST		G,W
BK1 C3	48-72	2.5Y 5/3	2.5Y 6/2	/	SiC	MASSIVE	VH	VFI	VS/VP	/	GR-3 CB-0 ST-0	/	1VF TU	2fmCAM ST		
BK2 C4	72-[illegible]	2.5Y 5/2	2.5Y 6/2		SiC	MASSIVE	EH	EFI	VS/VP	/	GR- CB- ST-		1VF TU	1fmCAM ST		
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

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26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35"	2	>100"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Ochric	Calcic	10-30"

Previous edition Obs.

FS-2500-1 (2/86)

USDA - Forest Service

SOIL DESCRIPTION

(Refer to FSH 2509.18) Digital Version

Aridic Calciustoll

0371280 4140210

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
9	Mixed, Super, Fine, Smectitic, Mesic Haplustoll	11/5/96	DC	2 Pits 1 Pedon	29		Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow Road	Backhoe Pit		UT	Garfield

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion:
Alluvium	Tropic Shale		a. Kind Sheet b. Class Slight

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
Footslope	a. % 5 b. Shape Concave c. Length 70' d. Aspect 290°	SPD	a. GR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
PJ w/ Sagebrush			None

HORIZON DESIGNATION (a)	DEPTH (b) Inches	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/4	10YR 5/3	/	Loam 27	2MF SBK	SH	FR	SS/PO	/	GR 0 CB 0 ST 0	2VF IN 2F TU	2F IN 1VF	SE		CS
A2	6-12	10YR 4/3	10YR 6/3	/	Loam 29	[illegible]	SH	FI	SS/PS	/	GR 0 CB 0 ST 0	2VF IN 1F TU	2F 2M 2VF	SE		CS
BwK1 CT	12-36	2.5Y 5/3	2.5Y 6/2	/	Sic 39	3MPR NTBK	SH	VFI	VS/VP	/	GR CB TR ST 0	1VF-F TU	1VF 1F	3-5% fCAM ST		CW
BwK2 CT	36-60	2.5Y 5/2	2.5Y 7/2	/	Sic 42	3MPR [illegible]	SH	VFI	VS/VP	/	GR 2 CB 2 ST 0	1F TU	V1VF	5-8% fmCAM		CW
C3 BK1	60-115	2.5Y 5/2 10YR 5/3	2.5Y 6/3 10YR 6/4	(60) 10YR 6/4 (40) mottles	Clay 44	MASSIVE	SH	VFI	VS/VP	/	GR 4 CB 2 ST 0	1VF TU	/	5-8 fmCAM		CW
BK2	115-138	2.5Y 5/1 2.5Y 5/3	2.5Y 6/2 2.5Y 6/1	10YR 6/4 30% mottles	Clay 45	MASSIVE	SH	EFI	VS/VP	/	GR 2 CB 2 ST 0	1VF-F TU	/	ST		
											GR CB ST					
											GR CB ST					
											GR CB ST					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>35"	3%	>138"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	Calcic	10-30"

Previous edition obsolete.

FS-2500-1 (2/86)

Div. of Oil, Gas & Mining
OCT 16 2000
INCORPORATED

USDA - Forest Service

Aridic Calciustept

SOIL DESCRIPTION

(Ref. FSH 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
	mixed ~~Thermic~~ Super, mesic	11-15-90	PBC		30		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow Habitat Area			UT	Iron

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Tropic Shale		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Footslope	4	Plane	150	280	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Sagebrush Grass FS (SEED20)	16-17"		None

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	SPECIAL FEATURES (g) % of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	2.5Y 4/3	2.5Y 5/2	/	SiC 32	2m-F Sbk	SO	FR	SS/PS	/	GR-0 CB-0 ST-0	VF IF M	3VFIN 1FTU	SE		C,S
A2	6-12	2.5Y 4/2	2.5Y 6/2	/	CLAY 42	3m-C SBK	HA	FI	VS/VP	/	GR-0 CB-0 ST-0	VF IF	1VF-F TU	SE		C,W
Bw	12-36	10YR 4/3	10YR 6/3	/	CLAY 43	3m-C Pr	VH	VFI	VS/VP	/	GR-0 CB-0 ST-0	VF VF	1VF-F TU	SE		C,W
BwK Ck1	36-60	10YR 5/3	2.5Y 6/1	10YR 7/6	CLAY 43	3m-C Prism	VH	EF1	VS/VP	/	GR-TR CB-0 ST-0	/	1VF TU	4FCAM ST		C W
BwK Ck2	60-105	10YR 5/3	10YR 6/2	10YR 7/6	SiC 40	Sbk Prism	EH	EF1	VS/VP	/	GR-3 CB-0 ST-0	/	1VF TU	4FCAM ST		C,W
C	105-120	Accretion		20fm 10YR 7/6	Box					/	GR-4 CB-0 ST-0	/		VE		
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	>40"	2	>120"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Ochric	Calcic	10-30"

Div. of Oil, Gas & Mining
OCT 15 2002
RECEIVED

FLUVENTIC HAPLOSTOLL (Reference FSH 2509.18)

1. Map Unit Sy	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T ___ R ___
3	FLUVENTIC ~~CALCIC~~ ARGIUSTOLL	11/16/	BC		31		

9. Area	10. Forest	11. Ranger District	12. State	13. County
SOUTH HIGH WAY	mix, super, mesic fine-loamy Calcic Argiustoll		UTAH	WAYNE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Mixed Alluvium		Moderate	Slight

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
FLOODPLAIN TERRACE	1	CONVEX	60'	270°	WD				

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
SURVEY CORRIDOR BETWEEN S. OF ROBINSON CREEK			NONE

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-7	10YR 3/3	10YR 4/2	/	2M-F LOAM	23	2M-F GR	SO	FR	SS/PS	/	CR 0 CB 0 ST 0	3VF 2F 1M	3VF 1N	NE		CS
BAT	7-17	10YR 4/4	10YR 6/4	/	LOAM	27	2M-F SBK	SH	FI	SS/P	70 CLF PF/PO	CR 0 CB 0 ST 0	2VF 2F 1M	2VF-F TU	SF		CS
BTK 1	17-38	7.5YR 4/3	7.5YR 5/3	/	SCL	29	2M-F ABK	SH	FI	SS/P	50 CLF PF/PO	CR 0 CB 0 ST 0	1VF 1F 1M	1VF-F TU	ST		CW
BTK 2	38-52	2.5Y 5/3	2.5Y 6/2	/	LOAM	40	2M-F SBK	SH	EFI	VS/VP	40 CLF PF/PO	CR 0 CB 0 ST 0	1F 1VF	1VF-F TU	ST		AS
2C1	52-75	10YR 5/3	10YR 7/3	/	SCL	15	MASSIVE	VH	VFI	SS/PO	/	CR 0 CB 0 ST 0	1VF 1F	2VF, 1F TU	VE		AS
2C2	75-100	7.5YR 5/4	7.5YR 7/4	/	SCL	8	SG	LO	LO	SO/PO	/	CR 0 CB 0 ST 0	1F 1VF	3VF 1N	SE		AW
2C3	100-155	NOT	SAMPLED		LOAM	5	SG	LO	LO	SO/PO		CR 0 CB 0 ST 0	/		ST		MOD
												CR CB ST					
												CR CB ST					

26. Typical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	17-37"	18-35	0	>9 FEET

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	MOLLIC (w/ MIXING)	CALCIC	10-30

INCORPORATED
OCT 15 2008
Div. of Oil, Gas & Mining

USDA - Forest ... Calcidic Argiustoll Typic Calciustoll **SOIL DESCRIPTION** (Reference ... 2509.18) UTM 037 059 4140104

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
#1	Fine-loamy mix super mesic ~~Fine Argiustoll~~	11/16/06	BC		32		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Survey			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Alluvium - Mixed			

18. Landform	19. Slope: a. % 2 b. Shape LINEAR c. Length 150' d. Aspect 280	20. Drainage Class	21. Surface Stone and Rock a. GR 0 b. CB 0 c. ST 0 d. BY 0
Alluvial Fan		WD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Fallow Field Mid-way Bottom			None Moist Sand @ 10 ft

HORIZON DESIGNATION (a)	DEPTH (b) (inches)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	CC	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-8	10YR 3/2	10YR 5/3	/	Loam	24	2M-F GR	SO	FR	SS/PS	/	CR 0 CB 0 ST 0	2VF 1VF 1M	3VF IN 1F TU	NE		C,S
B1	8-17	10YR 4/3	10YR 6/3	/	Clay Loam	31	2F M SBK	HA	F1	S/PS	2MK PF	CR 0 CB 0 ST 0	1F 1VF	1VF-F TU	NE		C,W
B1K1	17-31	10YR 4/4	10YR 6/4	/	Clay Loam	34	2M MSK	VH	VF1	S/PS	2MK PF	CR 0 CB 0 ST 0	1VF	1VF-F TU	NE		C,W
B2	31-51	7.5YR 4/3	7.5YR 6/4	/	SiC	34	3CM MSK	EH	EF1	VS/VP	1MPF	CR 0 CB 0 ST 0	1F	1VF-F TU	ST		C,S
B2K3	51-72	7.5YR 5/3 7.5YR 5/2	7.5YR 7/2 7.5YR 6/4	(70) (30)	Loam	23	3CM SBK	EH	VF1	S/P	/	CR 0 CB 0 ST 0	/	1VF-F TU			A,S
C1	72-80	7.5YR 5/3	7.5YR 7/4	/	SL	18	MASS INF	HA	FR	SS/PO	/	CR 0 CB 0 ST 0	/	1VF-F TU	VF		A,S
2C1	80-115	2.5Y 4/3	2.5Y 6/3	Faint 10Y	SiC	43	MASS INF	LO	EF	S/P	/	CR 0 CB 0 ST 0	/	1VF TU	VE		A,S
2C2	115-142	7.5YR 5/4	7.5YR 7/3	7.5YR 5/6	Coarse Sand	6	SG	LO	LO	SO/PO		CR 0 CB 0 ST 0	/	3VF IN	NE		Moist Sand
												CR CB ST					

Sampled for FOX only

26. Particle Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	33	0	>140"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	Calcic	10-30"

OCT 15 2008 Div. of Oil, Gas & Mining

FS 2000-1 (2/06)

USDA - Forest Service

SOIL DESCRIPTION

(Refer to FSM 2509.18)

Aridic Calciustoll

UTM 0371150 4140240

1. Map Unit Symbol	2. Family or Series	3. Date	By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ___ T. ___ R. ___
1	mixed Super, mesic	11/15/88	BC		33		

9. Area	10. Forest	11. Ranger District	12. State	13. County
Cedar Mountain Subwatershed			UTAH	ISANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Residuum	Tropic Shale			

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
Footslope	2	Planar	200'	280	Well	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Fallowed field in NE corner	15-16		None

HORIZON DESIGNATION (a)	DEPTH (inches) (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-10	7.5YR 3/3	7.5YR 5/3		Loam	2M GR PLATY	SH	FR	SS/PS		GR-0 CB-0 ST-0	3VF VF, IM	3VF IM 1F TU			C.W
Bw	10-24	10YR 4/2	10YR 6/3		SiL	3MSBK	MA	FI	VS/VP		GR-0 CB-0 ST-0	2VF 1F, IM	2VF-2F TU			G.W
Fwk	24-48	2.5Y 4/3	2.5Y 6/3			3CSBK	VH	EFI	VS/VP		GR-0 CB-0 ST-0	1VF 1F	1VF-F TU	ST		G.W
BK1	48-70	2.5Y 5/4 7.5Y 5/4	2.5Y 6/2 7.5YR 6/3	(30) (20)		3CPR		VFI	VS/VP		GR-0 CB-0 ST-0		1VF TU			G.W
BK2	70-100	2.5Y 5/3	2.5Y 6/3	CARBONATE CONCENTRATIONS	SiL	MASSIVE		EFI	VS/VP		GR-0 CB-0 ST-0		1VF TU			
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					
											GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	39	0	70 inches

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	Calcic	10-30"

Previous edition obsolete.

FS-2500-1 (2/86)

Div. of Oil Gas & Mining
OCT 15 2009
INCORPORATED

USDA - Forest S[illegible]

fine-loa[illegible] mx, super mesic Aridic Calciustoll

SOIL DE[illegible]RIPTION

(Referen[illegible] 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
4	~~Fam~~ ~~Horlustoll~~ Fine-loamy, mixed	3/7/07	BL		34	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
Coal Hollow	(Cont) V.Deed		UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion:
Alluvium + Residuum	Triassic Shale w/ Mixed Alluvium		a. Kind None b. Class

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
Footslope	a. % 2 b. Shape Slightly Concave c. Length 150' d. Aspect	WD	a. GR 0 b. CB 2 c. ST 1% d. BY

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Disked Field, Rabbitbrush, Sagebrush	16-18"		

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR Dry (2)	COLOR Mottling (3)	TEXTURE (d)	% C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/2	10YR 5/3	/	SiL	24	2M-F SBK	SO	VFR	SS/PO	/	GR - / CB - / ST - /	3VF 2F		NE	7.6	C.W
Bw	9-17	10YR 4/3	10YR 6/3	/	SiL	27	2M SBK	SH	FR	SS/PO	/	GR - 0 CB - 0 ST - 0	2VF 1F		SF	7.4	C.S
BK1	17-27	10YR 5/4	10YR 7/3	/	SiL	26	2M-C SBK	HA	VFI	SY/PO	/	GR - 0 CB - 0 ST - 0	VF, F		ST 5fCAM	8.2	C.S.
BK2	27-45	10YR 5/3	10YR 6/3	/	SL	14	2C SBK	HA	VFI	SY/PO	/	GR - 2 CB - 0 ST - 0	1VF		10fm CAM ST	8.5	C.W
2BK	45-[illegible]	10YR 5/3	10YR 7/3	/	LS	3	MASSIVE	SH	V	SY/PO	/	GR - 3 CB - 0 ST - 0	1VF		15fm CAM VE	8.6	
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
		19	7-15%	>60

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	CAMBIC	10-30

OCT 1 9 2007

EXISTING VEGETATION

30. (Species) TREES (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	32. (Species) FORBS (% Crown Cover)	33. (Species) GRASSES (% Crown Cover)

34. Additional Notes (*Use and Management*):

LAB CHARACTERIZED TOP 5 SAMPLES

SOIL MICRO MONOLITHS BOX TAKEN

R | MINING DISTURBANCE

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

WITHIN OLD CANAL HIGH SAGEBRUSH

Aridic Calciustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
H	fine-loamy, mix, super, mesic	3-7-07	BC		35	DITON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
OLD CANAL			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM			NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FANSLOPE	3	CONVEX			WD			2	2

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
BIG SAGEBRUSH RABBITBRUSH			

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A1	[illegible]	10YR 3/3	10YR 5/2	/	SiL		2FSBK → MGR	SU	FR	SO/PO	/	GR-2 CB-0 ST-0	3VF 2F		NE	7.4	CS
A2 ~~BT~~	9-19	10YR 5/4	10YR 6/3	/	SiCL		2F-M SBK	SH	VFI	SS/PS	1MKPF 1MPO	GR-2 CB-0 ST-0	VF 1F		VS	7.6	CW
B~~T~~K	19-30	10YR 5/3	10YR 7/3	/	LOAM		2M-F SBK	HD	FI	SS/PS	2M PO	GR-2 CB-0 ST-0	VINF		ST ~~SC~~ 5FCAM	8.4	CW
BK1 ~~CK~~	30-45	10YR 5/3	10YR 7/3	/	FSL		3C-M SBK	HA	VFI	SS/PO	/	GR-2 CB-0 ST-	/		VE 15 mCAM	8.6	GW
BK2 ~~CK2~~	45-70	10YR 6/3	10YR 7/2	/	S. LOAM		3C-M SBK	HA	VFI	SS/PO	/	GR-3 CB-1 ST-0	/		VE 20 mCAM	8.6	GW
2C	70-95	10YR 6/3	10YR 8/3	/	GR		MASS INC	SLD	FA	SO/PO	/	GR-35 CB-5 ST-2	/		15fmCAM ~~ST~~	8.7	
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	9-29	26	<20%	>60

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	NONE	ARGILLIC	10-30"

OCT 15 2009 DIV. OF OIL GAS & MINING RECEIVED

EXISTING VEGETATION

30. (Species) TREES	(% Crown Cover)	31. (Species) SHRUBS	(% Crown Cover)	32. (Species) FORBS	(% Crown Cover)	33. (Species) GRASSES	(% Crown Cover)

34. Additional Notes *(Use and Management)*:

NUGERED CAST 15" in 2C THEN HIT COARSE ALLUVIUM

LNB CHARACTERIZED TOP 5 SAMPLES 0-9"

9-19"

SOIL MICRO-BOX TAKEN

19-30

30-45

45-65

YR 1 COAL MINING DISTURBANCE

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

Aridic

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
H	~~Fine~~ CALCUSTOLL fi-LOAMY, MIX super mesic	3/7/06	BC		36	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
COAL HOLLOW			UTAH	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
~~MIXED~~ ALLUVIUM	SEDIMENTARY ALLUVIUM		NONE	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
FAN	4	~~NONE~~	75'	230		0	2	3	1

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
OAK W/ ARTEMA	16-18		NONE

HORIZON DESIGNATION (a)	DEPTH (b) INCHES	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (k) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 3/3	10YR 5/3	/	LOAM		3M-C GR	SO	VFR	SO PO	/	GR-0 CB-0 ST-0	2vf 1F		NE	7.9	C,S
BW	9-24	10YR 4/3	10YR 6/3	/	~~LOAM~~ SL	12	3M-F SBK	HA	VFI	SS PO	/	GR- CB- ST-	2F 1VF		SE ~~NE~~ 2VFCAM	8.2	C,S
BWK	24-41	10YR 5/4	10YR 7/3	/	~~LOAM~~ SL	10	3M-C NBK	VHA	VFI	SS PO	/	GR- CB- ST-	1VF		ST ~~SE~~ 8FCAM	8.4	A,S
BK ~~2~~	41-68	10YR 5/4	10YR 7/3	/	F ~~SANDY~~ LS		MASS INE	LO	LO	SO PO	/	GR- CB- ST-	/		ST ~~SE~~ 12FCAM	8.4	A,W
2C	68-85	10YR 5/3	10YR 6/3	/	LS		SG	LO	LO	SO PO	/	GR- CB- ST-	/		ST ~~SE~~ CAC BRF	8.4	
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
		12%	<5%	

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
		cambic / calcic	

Previous edition obsolete.

FS-2500-1 (2/86)

OCT 15 2009 DIVISION OF OIL, GAS & MINING

EXISTING VEGETATION

30. *(Species)* TREES	*(% Crown Cover)*	31. *(Species)* SHRUBS	*(% Crown Cover)*	32. *(Species)* FORBS	*(% Crown Cover)*	33. *(Species)* GRASSES	*(% Crown Cover)*

34. Additional Notes *(Use and Management)*:

SAMPLED BY AUGER TO 3.5" FROM TRENCH BOTTOM

LAB COMPARISON 4 SAMPLES TO 68'
GRIZZO ONLY

MICRO-SOIL BOX MADE

SOIL DESCRIPTION

Soil Type

File No.

Area CORL [illegible] | Date 3-7-07 | Stop No. 37

Classification [illegible] Aridic [illegible] MIX MESIC SUPERIOR, V DEEP

Location: Section T R

N. Veg. RABBITBRUSH - SAGEBRUSH, FEW JUNIPER

Parent Material ALLUVIUM | Climate (Precip.) USTIC

Physiography VALLEY FLOOR | Surface Rock Fragments Gravel 0

Relief CONCAVE | Drainage WELL DRAINED | Surface Rock Fragments Cobble 0

Elevation 6700 | Gr.water — | Surface Rock Fragments Stones 0

Slope 4 % | Range | Moisture | Surface Rock Fragments Other

Aspect/Degrees 270° | Root Distr. | % Clay *PSCS

Erosion NONE | % Coarse fragments *PSCS | % Coarser than V.F.S. *PSCS

Permeability MODERATE | Range Site

GPS Latitude N | Microbiotic Crust Class

GPS Longitude W | Rock Formation/Type ALLUVIUM MIXED [illegible]

GPS Elevation | Topo Quad Name ALTON

Soil Temp at 20" F | Photo Number

Additional Notes DISTURBED & SEEDED AREA

* LAB [illegible] 5 [illegible] (TO 56")

SOIL MICRO MORPHOLOGY BY TAYLOR

*Control Section Average

Horizon	Depth	Color Dry	Color Moist	Texture Clay	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction Effer.	Boundary	Rock Frags	Root	Pore	Ped Surface Features
A	0-6	10YR 5/3	10YR 3/2	SICL 30	2M-F GR	SO	VFR	SS PU	NE	C, W	/	3VF 1F		pH 7.2
A2	6-12	10YR 5/3	10YR 3/3	SICL 31	2M-F GR	SO	FR	SS PS	NE	C, S	/	2VF 1F		7.2
BWK1	12-[illegible]	10YR 6/3	10YR 4/3	SANDY LOAM → SCL 30	3F M ABK	HA	FI	S PS	5f CAM ST	C, S	/	1VF		7.8
BWK2	[illegible]	10YR 7/4	10YR 5/4	LS 8	3M ABK	VH	VFI	SO PO	15fm CAM ST	C, W	2	1VF		8.4
BK1	[illegible]	10YR 7/4	10YR 5/4	LFS 6	3C-M SBK	HA	FI	SO PO	15f cam ST	C S	3 4	/		8.4
RBK1	[illegible]	10YR 7/4	10YR 5/4	SCL 4	MASSIVE	LO	LO	SO PO	10fvf CAM ST	A, S	10CM 30	/		8.4
RBK2	[illegible]	10YR 7/3	10YR 5/3	SANDY LOAM	SG	LO	LO	SO PO	VE ~~ST~~ 15fvf CAM		0	/		8.4

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Microbiotic Crust

Two classes are suggested:

Immature - gray crust of cyanobacteria the sheaths and filaments of which connect soil particles; takes about 5 years to develop

Mature - dark black crust with pedestals; in addition to the bacteria it includes mosses, fungi, and lichens; takes 50 or more years to develop

Quantity definitions for percentage surface cover of microbiotic crusts

- Very few - less than 5% per 10 square feet
- Common - 15 to 50% per 10 square feet
- Few - 5 to 15% per 10 square feet
- Many - more than 50% per 10 square feet

Plasticity

Fld.Code	Class	Description	Fld. Code	Class	Description
PO	Non-plastic	4cm long /6mm thick roll cannot be formed	P	Moderately	4cm long/4mm thick roll will support weitht
PS	Slightly plastic	4cm long/ 6mm thick roll will support weight	VP	Very plastic	4cm long/2mm thick roll will support weight

Stickiness

Fld.Code	Class	Description	Fld.Code	Class	Description
SO	Non-sticky	No material adheres to thumb or forefinger	S	Moderately	Adheres to both digits;stretches slightly
SS	Slightly sticky	Adheres to both digits; does not stretch appreciably	VS	Very sticky	Adheres to both digits;stretches appreciably

Effervescence

Fld. Code	Class	Description	Est. CCE	Fld.Code	Class	Description	Est. CCE
eo	Non-effervescent	No bubbles seen	0	es	Strongly effervescent	Bubbles form low foam	15-40
e	Very slightly efferv.	Few bubbles seen	1-3	ev	Violently effervescent	Forms thick foam quickly	40+
em	Slightly effervescent	Bubbles readily seen	3-15				

Pores

Pores are described as a *quantity class, diameter size*, and *shape*

Quantity Class Definitions

Per Unit Area Definitions

- 1 centimeter squared for very fine and fine pores (.40 in^2)
- 1 decimeter squared for medium and coarse pores (4 in^2)
- 1 meter squared for very coarse pores (40 in^2)

Quantity Definitions

- Few - less than 1 per unit area
- Common - 1 to 5 per unit area
- Many - more than 5 per unit area

Diameter Definitions

- Very fine - less than 0.5 mm
- Fine - 1 to 2 mm
- Medium - 2 to 5 mm
- Coarse - 5 to 10 mm
- Very coarse - more than 10 mm

2 common pore shapes are present:

- Tubular - cylindrical or elongated
- Vesicular - spherical or elliptical

Roots

Roots are described as a *quantity class and diameter*

Quantity Class Definitions

Per Unit Area Definition s

- 1 centimeter squared for very fine and fine pores (.40 in^2)
- 1 decimeter squared for medium and coarse pores (4 in^2)
- 1 meter squared for very coarse pores (40 in^2)

Quantity Definitions

- Very few - less than .2 per unit area
- Moderately few - .2 to 1 per unit area
- Few - less than 1 per unit area
- Common - 1 to 5 per unit area
- Many - more than 5 per unit area

Diameter Definitions

- Very fine - less than 1 mm
- Fine - 1 to 2 mm
- Medium - 2 to 5 mm
- Coarse - 5 to 10 mm
- Very coarse - more than 10 mm

Terms for Rock Fragments

Shape and Size	Noun	Shape and Size	Noun
Seherical, cubelike, or equiaxial:		Flat:	
2-75 mm diameter	Gravel	2-150 mm long	Channers
75-250 mm diameter	Cobbles	150-380 mm long	Flagstone
250-600 mm diameter	Stones	380-600 mm long	Stones
≥600 mm diameter	Boulders	≥600 mm long	Boulders

Rupture Resistance Classes for Blocklike Speciments

Classes Dry	Moist	Test Description
Loose	Loose	Specimen not obtainable
Soft	Very friable	Fails under very slight force applied slowly between thumb and forefinger
Slightly hard	Friable	Fails under slight force applied slowly between thumb and forefinger
Moderately hard	Firm	Fails under moderate force applied slowly between thumb and forefinger
Hard	Very firm	Fails under strong force applied slowly between thumb and forefinger
Very hard	Extremely firm	Cannot be failed between thumb and forefinger but can be between both hands or by placing on a nonresilent surface and applying gentle force underfoot

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

fine, mx, super frigid Aeric Epiaquept

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
7	~~Calciaquoll, silty~~	3/7/07	BL		38	Alton	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
Fremont Horizon	Soil Survey		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion:
[illegible]	Mixed Alluvium		a. Kind None b. Class

18. Landform	19. Slope:	20. Drainage Class	21. Surface Stone and Rock
Swale in valley fill	a. % 2 b. Shape concave c. Length 180 d. Aspect 190	PD	a. GR 0 b. CB 0 c. ST 0 d. BY 0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Rose, sagebrush, cheat grass, sedges	16-18"		29 inches

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 4/2	10YR 6/2	no	SiL	3m-f sbk	sh	vfr	s p	/	GR - 0 CB - 0 ST - 0	3vf 3f 2m		SE	7.5	[illegible]
AB	6-12	10YR 5/4	10YR 7/3	no	SiL	3m-f pr	sh	fi	s p	/	GR - 0 CB - 0 ST - 0	3f 2vf 1m		ST 3f CAM	8.0	[illegible]
Bk1	12-24	10YR 6/4	10YR 7/2	10% 3m Gleyed	SiL	massive	h	fi	s p	/	GR - 0 CB - 0 ST - 0			25f m CAM VE	8.6	[illegible]
Bk2	24-40	10YR 7/2	10YR 8/1	[illegible]	SiL	m	h	Gleyed fi	s pst	/	GR - CB - ST -			40 m CAM VE	8.7	
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					
											GR - CB - ST -					

Not sampled here, take subsoil from backhoe pit (40")

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:

OCT 15 2008 DIVISION OF OIL, GAS & MINING

EXISTING VEGETATION

30. *(Species)* TREES	*(% Crown Cover)*	31. *(Species)* SHRUBS	*(% Crown Cover)*	32. *(Species)* FORBS	*(% Crown Cover)*	33. *(Species)* GRASSES	*(% Crown Cover)*

34. Additional Notes *(Use and Management)*:

SAMPLES HAND / AUGER IN AREA ABOVE PIPELINE 100 YARDS NE OF BACKHOE PIT (SUBMERGED IN WATER

LAB [illegible] ALL 4 SAMPLE

SOIL MICRO [illegible] BOX (W/ #40) COMBINED

USDA - Forest Service

Aridic

SOIL DESCRIPTION

(Reference Handbook 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ____ T. ____ R. ____
4	~~Typic~~ Coarse CO-LOAMY MIX	3-7-6	BK		39	Alvord	

9. Area	10. Forest	11. Ranger District	12. State	13. County
[illegible]	Super, mesic → V DEEP		UTAH	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
[illegible]	Alluvium [illegible]		None	

18. Landform	19. Slope: a. % ____ b. Shape ____ c. Length ____ d. Aspect ____	20. Drainage Class	21. Surface Stone and Rock: a. GR ____ b. CB ____ c. ST ____ d. BY ____
FAN SLOPE		WD	

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Grasses DISTURBED AREA NEXT TO CANAL			[illegible]

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
Ap	0-6	10YR 3/2	10YR 5/3	/	SiL		2m-f GR	SO	FR	SS/PS	/	GR-0 CB-0 ST-0	2VF 2F 1M		NE	7.6	C.W
A2	6-12	10YR 3/3	10YR 5/4	/	SiL → LoSi	24	2FSBK → m GR	SO	FR	SS/PS	/	GR-0 CB-0 ST-0	1VF 2F 1M		VS	7.8	C.S
BK1	12-24	10YR 5/4	10YR 6/4	/	SL	15	3m-c ABK	VH	VFI	SO/SO	/	GR-0 CB-0 ST-0	VIVF		ST 8f CAM	8.4	G.W
BK2	24-36	10YR 5/4	10YR 7/3	/	GR SL	7	3m-c ABK	VH	VFI	SO/PO	/	GR-10 CB-5 ST-0	/		ST 10f CAM	8.4	G.W
2C	36-75	10YR 5/3	10YR 7/3	/	CBW LSAND		MASSIVE	VH	FI	SO/PO	/	GR-75 CB-30 ST-0	/		ST 15f CAM 1mm CAM BRF	8.2	
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	~~35~~ 11%	< 35	>60

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	CAMBIC	

OCT 15 2008

Previous edition obsolete.

FS-2500-1 (2/86)

EXISTING VEGETATION

30. (Species) TREES (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	32. (Species) FORBS (% Crown Cover)	33. (Species) GRASSES (% Crown Cover)

34. Additional Notes (*Use and Management*):

FIRST 4 samples TO 36"

LAB chromatograph ONLY ON

SOIL MICRO-PUR MUSE

USDA - Forest Service

SOIL DESCRIPTION

Aeric Calciaquoll

(Reference FSH 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
#7	Fine-Loamy, mixed, superactive, frigid	7-7-07	BC		40	Alton	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
Cedar Breaks NM	BLM Water Monitoring		Utah	Kane

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
Alluvium	Mixed sedimentary alluvium		None	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock a. GR	b. CB	c. ST	d. BY
Valley Floor	3	Linear	75'	180	SPD	0	0	0	0

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
Cheat grass	16-18		23 [illegible]

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	Dry (2)	Mottling (3)	TEXTURE (d)	%C	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	Moist (2)	Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-6	10YR 3/2	10YR 5/2	/	SiL		2 vfgr	SO	VFR	SS/PU	/	GR - 0 CB - 0 ST - 0	3vf 2f 2m 2c		SE	7.8	A-Ag
Ag	6-12	10YR 4/3	10YR 6/3	yes	SiLt		2 vfc gr	SO	VFR	SS/PU	/	GR - CB - ST -	3vf 2f 2m 2c		ME	8.2	Ag-C
BK	12-22	10YR 5/4	10YR 7/3	yes	SiLt		massive	SH	FR	SS/PU	/	GR - CB - ST -	2vf 2f 2m		ST 12-15 f CaCO3	8.4	Ag-W
Gg	[illegible]	[illegible]	Bedrock	24 [illegible]	[illegible]		water	Tough			/	GR - CB - ST -					
Cg	22-[illegible]			Gleyed	Silt		massive					GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:

Duplicate & Mailing
OCT 15 2008
INCORPORATED

EXISTING V[illegible]ATION

30. *(Species)* [illegible]S	*(% Crown Cover)*	31. *(Species)* SHRUBS	*(% Crown Cover)*	[illegible]*pecies)* FORBS	*(% Crown Cover)*	33. *(Species)* GRASSES	*([illegible]wn Cover)*

34. Additional Notes *(Use and Management)*:

Oe [illegible] NOT DECOMPOSED PLANT ROOTS SEEN

[illegible] [illegible] [illegible] [illegible]

SOIL [illegible] BOX (COMBINED W/ #38)

USDA - Forest Service

SOIL DESCRIPTION

(Reference FSH 2509.18)

mesic fine mixed, super AridicCalciustoll

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location: Sec. ____ T. ____ R. ____
9					41		

9. Area	10. Forest	11. Ranger District	12. State	13. County

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind ____ b. Class ____

18. Landform	19. Slope: a. % ____ b. Shape ____ c. Length ____ d. Aspect ____	20. Drainage Class	21. Surface Stone and Rock a. GR ____ b. CB ____ c. ST ____ d. BY ____

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)

HORIZON DESIGNATION (a)	DEPTH (b)	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	Roots (3)	Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A1	0-6	10YR 3/3	10YR 5/3	/								GR - CB - ST -			NE	7.9	
A2	6-12	10YR 3/3	10YR 5/3	/	CL	38						GR - CB - ST -			NE	8.0	
BwK	12-36	10YR 4/3	10YR 6/3	/	C	42						GR - CB - ST -			ST 3-5 f CAM	8.2	
Bk1	36-64	10YR 5/4	10YR 7/3	/	CL	32						GR - CB - ST -			VE 12 fm CAM	8.2	
Bk2	64-80	10YR 5/4	10YR 7/4	/	SCL	22						GR - CB - ST -			VE 10 f CAM	8.6	
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					
												GR - CB - ST -					

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OCT 15 2003

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	40	0	760"

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:
	Mollic	cambic / Calcic	

30. (Species) TREES (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	32. (Species) FORBS (% Crown Cover)	33. (Species) GRASS (% Crown Cover)

34. Additional Notes *(Use and Management)*:

SAMPLED 5 INCREMENTS

2 FROM PHOTOS, 1 LANDSCAPE

MICRO
SOIL BOX MADE

YR 1 Mining Disturbance

USDA - Forest Service

W

Aridic Haplustoll

f-loamy mixed Series, mesic

SOIL DESCRIPTION

(Reference FSH 2509.18)

1. Map Unit Symbol	2. Family or Series	3. Date	4. By	5. Photo. No.	6. Stop No.	7. USGS Quad	8. Location:
9	~~Family~~ ~~Aridic~~ ~~Haplustoll~~ ~~mixed~~	3/6/07	BL		42	ALTON	Sec. ____ T. ____ R. ____

9. Area	10. Forest	11. Ranger District	12. State	13. County
ROBINSON CREEK CUTBANK			UT	KANE

14. Parent Material	15. Bedrock Name	16. Elevation	17. Erosion: a. Kind	b. Class
ALLUVIUM	WINGATE SANDSTONE FORMATION		MW	

18. Landform	19. Slope: a. %	b. Shape	c. Length	d. Aspect	20. Drainage Class	21. Surface Stone and Rock: a. GR	b. CB	c. ST	d. BY
STREAM TERRACE	7	SHORT	50	-	WD				

22. Potential Natural Vegetation	23. Annual Precipitation	24. Measured Soil Temperature	25. Water Table (Depth)
JUNIPER / SAGEBRUSH, ROBBINSBRUSH			

HORIZON DESIGNATION (a)	DEPTH (b) IN/FEET	COLOR (c) Moist (1)	COLOR (c) Dry (2)	COLOR (c) Mottling (3)	TEXTURE (d)	%	STRUCTURE (e)	CONSISTENCE (f) Dry (1)	CONSISTENCE (f) Moist (2)	CONSISTENCE (f) Wet (3)	SPECIAL FEATURES (g) Cutans (1)	% of Rock Fragments (2)	SPECIAL FEATURES (g) Roots (3)	SPECIAL FEATURES (g) Pores (4)	EFFER. CLASS (h)	FIELD pH (i)	BOUNDARY (j)
A	0-9	10YR 5/2	10YR 5/3		CBL	20	Amf GR	SH	VFR	SO PO	/	GR-10 CB-5 ST-0	Vf 2F 1M		ME	7.8	Clear
2Bw	9-24	10YR 4/3	10YR 6/3		CBC	43	Zmc SBK	SH	FI	SS PO	/	GR-10 CB-5 ST-0	Vf 1F 1M		ST	8.2	Clear
2 Bwk	24-36	10YR 5/3	10YR 6/3		SCL	21	Zmc SBK	SH	FI	SS PO	/	GR-5 CB-3 ST-0	1F 1M		ST	8.4	Clear
2 BK	36-48	10YR 5/4	10YR 6/4		L	22	Massive	HD	FI	SS PO	/	GR-TR CB-TR ST-0	Vf 1F		ST	8.6	
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					
												GR- CB- ST-					

Oil and Gas Mining

OCT 15 2007

RECEIVED

26. Partical Size Control Section	a. Depth:	b. Average Clay %:	c. Average Rock Fragment Content:	27. Depth to Lithic or Paralithic Contact:
	10-40"	31%		

28. Diagnostic Horizons	a. Surface:	b. Subsurface:	29. Moist Control Section Depth:

30. (Species) TREES (% Crown Cover)	31. (Species) SHRUBS (% Crown Cover)	32. (Species) FORBS (% Crown Cover)	33. (Species) GRASS (% Crown Cover)

34. Additional Notes (Use and Management):

SAMPLED 4 INCREMENTS TO 48" 0-9, 9-24, 24-36, 36-48"

PEDON TAKEN 2 PHOTOS 1 LANDSCAPE OF MU 43

BACKSIDE FIN AT EDGE OF RODINSON ARROYO

NO MICROMORPHIC BOX FOR THIS PROFILE MADE

OR PHOTOGRAPHED

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 43

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 7	Photo #:	Classification: Typic Argiaquoll fine, mixed, superactive, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2007	Weather: High Clouds	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum: 1983	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape: Bench	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: SSW 210°	Slope (%): 4	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Very Poorly	Flooding: —	Ponding: Oc	Soil Moisture Status: Saturated	Permeability: K_{sat}: Very slow	Land Cover / Use: Pasture

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: None	Runoff: mod slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Mollic 0-7" Argillic 7-30" Calcic 17-96"

P. S. Control Section : Depth Range: 7-27"	Ave. Clay %: 40	Ave. Rock Frag %: 0

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	wildrose	
	Bluegrass	
	Sedges	

MISCELLANEOUS FIELD NOTES / SKETCH :

water flowing in 30-54" layer & perching on 54-72"

OCT 15 2008

Component Name: | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-7"	A	CS	10YR 5/2	10YR 3/3	L	—	2m sbk	VH	fr	SS	mP	—
2		7-17	Bt	CS	10YR 6/2	10YR 3/3	C	—	3 mc pr 2f sbk	XH	fi	S	P	20 fm 7.5YR 6/6
3		17-30	Btk	CS	10YR 7/2	10YR 4/3	CL	—	3 mpr 2f sbk	VH	fi	S	P	35 fm 7.5YR 6/4
4		30-54	Bk	as	10YR 7/2 & 8/3	10YR 4/2	SiL	—	2 mpr 1f sbk	VH	fr	SS	mP	45 fm 10YR 5/4
5		54-72	2Btk1	gs	10YR 7/1	10YR 4/1	C	—	3 mpr	xH	vfi	VS	VP	50 m 7.5YR 6/6
6		72-96"	2Btk2		10YR 8/1	10YR 6/1	SiC	—	2cmpr	xH	vfi	VS	VP	35 mc 10YR 6/8
7														
8					mollic	after	mixing	0-7"						
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	3vff 1m	2vft	8.2	SE	24		
2	—	—	85 CLF PF/PO	3vff 1m	1vft	8.4	SE	42		
3	—	15f CAM	75 CLF PF/PO	2vf 1fm	1vft	8.4	ST	38		
4	—	20fm CAM	—	2vf 1fm	1vft	8.6	ST	26		
5	—	10f CAM	100 CFF PF/PO	1vff	1vft	8.6	VE	50		
6	—	10f CAM	90 CLF PF/PO	1vf	—	8.4	VE	46		
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 44

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 7	Photo #:	Classification: Aeric Epiaquept fine, mixed, superactive, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2007	Weather: High clouds Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: SW 228°	Slope (%): 4-5	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear
Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:	

Drainage: ~~Poor~~ Very Poorly	Flooding: No	Ponding: Oc	Soil Moisture Status: Wn 0-14" Wa 14-34	Permeability: K_{sat}: Very slow	Land Cover / Use:

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth: 34+ moist	Lithostrat. Units: Group: Formation: Member:		

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Calcic 14-96"	
P. S. Control Section: Depth Range: 10-40"	Ave. Clay %:	Ave. Rock Frag %:	aquic 7"+	

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Sedges	
	Bluegrass	

MISCELLANEOUS FIELD NOTES / SKETCH:

water filling pit at 14"

34-96" old decaying roots

BUREAU OF LAND MANAGEMENT
OCT 15 2009
UT-STATE OFFICE

44

Component Name: | Map Unit Symbol: | Date: Apr 5 2007

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd	Rock Frags Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles %	Mottles Sz	Mottles Cn	Mottles Col	Mottles Mst	Mottles Sp	Mottles Loc
1	BP	0-7"	A1	CS	10YR 6/2	10YR 4/2	SiL	—			3 m sbk / 2 f sbk			H	Fr	ms	mp	—						
2	↓	7-14"	A2	CS	10YR 6/2	10YR 4/2	SiCL	—			2 m cpr / 3 fm sbk			VH	fi	ms	mp	10 f			7.5YR 6/4			
3		14-34"	Bwk1	as	10YR 8/1	10YR 6/2	SiCL	—			1 m pr / 2 m sbk			VH	fi	ms	mp	40 fm			7.5YR 6/6			
4		34-54"	Bwk2	gs	10YR 8/1	10YR 6/1	C	—			3 m cpr / 2 f sbk			XH	vfi	vs	vp	60 mc			7.5YR 5/8			
5		54-72"	Bwk1	gs	10YR 8/1	10YR 6/1	C	—			3 m cpr			XH	vfi	vs	vp	25 mc			10YR 6/6			
6		72-96"	BK2		10YR 8/1	10YR 6/1	SiL	—			M			VH	Fr	ms	mp	40 fm			10YR 6/6			
7																								
8																								
9																								
10																								

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	3 vff / 2 m	2 vft	8.2	SE	26		
2	—	—	—	3 vff / 2 m	2 vft	8.2	SE	28		
3	—	10 f CAM	—	2 vff / 1 m	2 vft	8.5	ST	26		
4	—	8 f CAM	—	2 vf / 1 f	1 vft	8.4	ST	48		
5	—	15 fm CAM	—	1 vf	—	8.6	VE	52		
6	—	18 fm CAM	—	—	1 vft	8.2	VE	26		
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 45

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 7	Photo #:	Classification: Aeric Epiaquept fine, mix, superactive, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2007	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Datum: Longitude: ° ' " W	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: Alton	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: 195° SSW	Slope (%): 3-4	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Poorly	Flooding: No	Ponding: 0c	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use: Pasture

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: sheet Degree: slight	Runoff:	Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: — Kind:	Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Depth Range: 35-48"	Ave. Clay %: 36	Ave. Rock Frag %: 0	argillic too deep	Argillic 84"+ Aquic 5"+ calcic 35-48"

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER

MISCELLANEOUS FIELD NOTES / SKETCH :

Rapid in-flow of water at 66"

OCT 15 2008 NRCS-CPD

Fluvent

45

Component Name: | Map Unit Symbol: | Date: Apr 05, '07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-5"	A1	cs	10YR 6/2	10YR 4/2	L	—	1m sbk 2f gr	sh	vfr	ss	sp	—
2		5-12"	A2	as	2.5Y 6/2	2.5Y 4/2	L	—	2 m pr 3f sbk	sh	vfr	ss	sp	3-4% vf 10YR 6/6
3		12-35"	C	as	10YR 7/4	10YR 5/4	SCL	—	1m sbk	sh	vfr	ss	sp	50 mc 10YR 6/6
4		35-48"	2 Bwk	cs	10YR 7/2	10YR 6/1	SiC	—	1m pr 2m sbk	h	fr	ms	mp	30 mc 7.5YR 5/4
5		48-66"	3C1	gs	10YR 8/2	10YR 6/4	SCL	—	m	h	vfr	ss	sp	50 mc 10YR 7/6
6		66-84"	3C2	as	10YR 8/3	10YR 6/4	SCL	—	m	vh	vfr	ss	sp	60 mc 10YR 7/6
7		84-100"	4Btk		10YR 7/1	10YR 6/1	SiC	—	3m pr 2m sbk	VH	fi	s	p	5f 7.5YR 7/6
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	disseminated	—	3vff 2m	2vft	8.4	ST	26		sm
2	—	disseminated	—	3vf 2f lm	2vft	8.2	ST	26		sm
3	—	disseminated	—	2vf 1fm	2vft	8.4	ST	35		wn
4	—	12f CAM disseminated	—	1vff	1vft	8.4	VE	42		ws
5	—	8f CAM disseminated	—	1vff	1vft	8.4	ST	30		wn
6	—	4f CAM disseminated	—	1vff	1vft	8.3	ST	30		ws
7	—	8f CAM disseminated	05 CLF PF/PO	1vff	—	8.3	VE	40		moist
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 46

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 7	Photo #:	Classification: Typic Argiaquoll fine-loamy, mixed, superactive, frigid	Soil Moist. Regime (Tax.): Ustic
Describer(s): Bob Long	Date: Apr 5, 2002	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Datum: Longitude: ° ' " W	Location: Sec. T. R.
UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU: Transect: ID: Stop #: Interval:

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: 195° SSW	Slope (%): 3-4	Slope Complexity:	Slope Shape: (Up & Dn / Across)

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Somewhat Poorly	Flooding: —	Ponding: Ra	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use: Pasture

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: — Kind:	Diagnostic Horz. / Prop.: Kind: Depth: Aquic 24"+ Mollic 0-7" Argillic 12-44" Calcic 44-92

P. S. Control Section: Depth Range: 12-32"	Ave. Clay %: 27.2	Ave. Rock Frag %: 14%

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	Grasses	

MISCELLANEOUS FIELD NOTES / SKETCH :

water flowing in at 44"

severe caving of sidewalls

OCT 15 2002 GEOTECHNICAL Div of Oil, Gas & Mining

Component Name:							Map Unit Symbol:								Date: Apr 5, 2007
Obser. Method	Depth (in)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1 BP	0-6"	A1	CS	10YR 5/3	10YR 3/3	SL	—	1m sbk / 2f gr	sh	vfr	so	po	—
2	6-12"	A2	gs	10YR 6/3	10YR 4/4	SCL	—	1m pr / 2f sbk	sh	vfr	ss	sp	—
3	12-17"	Bt1	CS	10YR 6/3	10YR 5/4	SCL	—	1m pr / 2f sbk	sh	vfr	ss	sp	—
4	17-24"	Bt2	CS	10YR 6/3	10YR 4/4	GRV SCL	Gr 30 CB 10	2m pr / 3fm sbk	sh	vfr	ss	sp	—
5	24-44"	2Bt	CS	10YR 6/4	2.5Y 4/4	CL	—	3m pr / 2fm sbk	vh	fr	s	p	5-8f faint 10YR 6/6
6	44-68"	2BKk1	gs	10YR 8/2	10YR 5/4	SL	—	m	vh	vfr	ss	po	25 mc strong 7.5YR 5/6
7	68-92"	2BKk2	gs	2.5Y 6/2	10YR 5/1	SL	—	m	xh	vfr	so	po	45 mc strong 10YR 6/6
8	92-120"	2C		10YR 6/2	10YR 5/1	SL	—	m	xh	vfr	so	po	65 vc strong 10YR 6/6
9													
10						mollic by mixing 0-7"							

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1		disseminated	—	2vff 1m	2vfti	8.4	em	16		
2			—	2vff 1m	2vft	8.5	em	18		
3			30 CLF PF/BR	2vff 1m	2vft	8.4	em	22		
4			25 CLF PF/BR	2vf 1f	2vfti	8.3	em	22		moist
5			65 CLF PF/BR	1vff	1vft	7.8	se	35		WS
6		2f CAM disseminated	—	1vf	2vfi	8.5	ST	15		WS
7		8f CAM disseminated	—	—	2vfi		ST	12		WS
8		4f CAM disseminated	—	—	2vfi		ST	12		WS
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 47

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 8	Photo #:	Classification: Calcic Haplustalf fine-loamy, mixed, superactive, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2007	Weather: High clouds	Temp.: Air: 55 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum: 1983
Location: Sec. T. R.					

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: Alton	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape: Valley	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: 5540 200	Slope (%): 6	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) convex / convex

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Somewhat poorly	Flooding: No	Ponding: No	Soil Moisture Status: moist	Permeability: K_{sat}: mod / slow	Land Cover / Use: Range

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: Flow patterns / slight	Runoff: mod slow	Surface Frag %: GR: 5 CB: — ST: — BD: — CN: — FL: — Kind:	Diagnostic Horz. / Prop.: Kind: Depth: Argillic 11-20" Calcic 20-84" Aquic 32"+

P. S. Control Section: Depth Range: 11-20"	Ave. Clay %: 30	Ave. Rock Frag %: 0

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Big sage	
	Rabbitbrush	
	Ut serviceberry	
	Rabbitbrush	
	Poa	

MISCELLANEOUS FIELD NOTES / SKETCH:

water running into pit at 80"

OCT 15 2008 CENTRAL FILE

Component Name: | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-3"	A	cs	10YR 5/3	10YR 3/3	L	GR 5	2 mc sbk	sh	vfr	ss	sp	—
2		3-11"	2A	as	10YR 6/4	10YR 5/3	SL	—	1 m sbk	h	fr	so	sp	—
3		11-20"	2Bt	cw	10YR 5/3	10YR 3/3	CL	—	2 m pr / 3 f vf sbk	vh	fi	ms	mp	—
4		20-32"	2Bk	cs	10YR 6/4	10YR 4/6	SCL	—	2 m pr / 2 f m sbk	xh	fr	ss	sp	—
5		32-52"	3Btk	cs	10YR 6/4	10YR 3/4	Clay	—	3 c pr / 2 m sbk	xh	vfi	vs	vp	10 ff 10YR 6/6
6		52-84"	3Bk		10YR 7/4	10YR 5/6	SCL	—	M	vh	vfr	ss	sp	40 mc strong 10YR 7/8
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1		disseminated	—	3 vf 2 f 1 m	2 vf fi	7.6	em	24		SM
2			—	2 vf f 1 m	2 vf i	7.7	em	15		SM
3			60 CLF PF/PO	2 vf 1 f m	1 vf t	7.8	em	30		moist
4		6 vf f CAM	90 CLF PF/PO	2 vf 1 f	2 vf i t	8.3	st	23		moist
5		10 f CAM	—	2 vf 1 f	—	8.3	em/st	50		moist
6		8 f CAM	—	1 vf	2 vf i t	8.5	es	20		moist
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: 48

DRAFT 3/2002

Series or Component Name: 1	Map Unit Symbol: 1	Photo #:	Classification: Aridic Haplustalf fine, mixed, superactive, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2007	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Datum: Longitude: ° ' " W	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape: Valley Bottom	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: ENE 80	Slope (%): 4-5	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage:	Flooding: No	Ponding: No	Soil Moisture Status:	Permeability: K_{sat}: Very slow	Land Cover / Use: Range

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: None	Runoff: mod slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 1-2 – – – – –	Diagnostic Horz. / Prop.: Kind: Depth: Argillic 3-84" Calcic 48-84" aquic 30-84"

P. S. Control Section : Depth Range:	Ave. Clay %: 62% (lab)	Ave. Rock Frag %:

VEGETATION :

SYMBOL:	COMMON NAME	% GD COVER
	ARTRW	
widely scattered	Juniper + Pinyon	
	Brome	

MISCELLANEOUS FIELD NOTES / SKETCH :

clay too hard to dig below 72"

RECEIVED OCT 15 2008 Division of Oil, Gas & Mining

mollic episaturation 48

Component Name:		Map Unit Symbol:	1	Date:	Apr 5, 2007

	Obser. Method	Depth (in)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	BP	0-3"	A	CS	10YR 5/2	10YR 3/2	CL	—	2 m sbk / 2 m gr	H	fr	ms	mp	—
2	↓	3-12"	Bt1	CS	10YR 4/2	10YR 4/2	clay	—	2 m pr / 3 m sbk	VH	fi	s	P	—
3	↓	12-30"	Bt2	gS	10YR 6/2	10YR 4/2	clay	—	3 mc pr / 2 m sbk	VH	fi	s	P	—
4	↓	30-48	Bt3	CS	2.5Y 6/2	2.5Y 4/2	clay	—	3 m pr / 2 m sbk	XH	vfi	vs	VP	16 fm distinct 7.5YR 5/6
5	↓	48-84	Btk		2.5Y 6/2	2.5Y 4/2	clay	—	3 m pr / 3 m sbk	XH	xfi	vs	VP	7 f distinct 7.5YR 6/6
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vffm	2vfft	7.8	e	30		
2	—	—	35 CLF PF/PO	2vff 1m	1vft	8.2	e	40		
3	—	—	85 CLF PF/PO	1vff	—	8.3	e	50		
4	—	3 vff CAM disseminated	90 CLF PF/PO	—	—	8.6	me	55		
5	—	10 f CAM 2 f Gyp Masses	95 CLF PF/PO	—	—	7.8	mg/st	60		
6										
7										
8										
9										
10										

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PEDON DESCRIPTION

PEDON ID #: 49

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 5	Photo #:	Classification: Lithic Ustorthent loamy, mix, super, calc, mesic	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: Apr 5, 2006	Weather: High clouds Temp.: Air: 60 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum: 1983	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #: 07 UT KA 49	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:		

Landscape: Ridge	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: 5	Slope (%): 8-12	Slope Complexity: complex	Slope Shape: (Up & Dn / Across) convex / convex
Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:	

Drainage: Well	Flooding: No	Ponding: No	Soil Moisture Status: S.M.	Permeability: K_{sat}: Mod	Land Cover / Use: PJ / Range

Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: sandstone	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: sheet Mod.	Runoff: mod rapid	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 25 3 1 1	Diagnostic Horz. / Prop.: Kind: Depth: Lithic 10"+
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:			Ochric

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Pinyon	
	UT Juniper	
	Black sage	
	Indian Ricegrass	

MISCELLANEOUS FIELD NOTES / SKETCH:

10% soils shallow to shallow
10% mod deep to sandstone

sandstone underlain by shale

Division of Oil, Gas & Mining
OCT 15 2008

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Component Name: Hideout | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles %	Mottles Sz	Mottles Cn	Mottles Col	Mottles Mst	Mottles Sp	Mottles Loc
1	SS	0-3"	A	cs	2.5Y 6/4	2.5Y 5/4	GR SCL	GR	30	1 fm 2 fgr	sbk		sh	vfr	ss	sp	—						
2	SS	3-10"	C	as	2.5Y 5/4	2.5Y 4/4	GR CL	GR	25	M			sh	vfr	ss	sp	—						
3	SS	10"+	R		sandstone																		
4																							
5																							
6																							
7																							
8																							
9																							
10																							

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vf 1fmc	2vf 1t	7.6	ST	28		
2	—	—	—	2vf 1fmc	1vf t	8.2	ST	32		
3										
4										
5										
6										
7										
8										
9										
10										

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PEDON DESCRIPTION

PEDON ID #: 50

DRAFT 3/2002

Series or Component Name:	Map Unit Symbol: 10	Photo #:	Classification: Aridic Ustorthent clayey, smectitic, super	Soil Moist. Regime (Tax.): Ustic Aridic

Describer(s): Bob Long	Date: Apr 5, '07	Weather: High Clouds Temp.: Air: 52° Soil: Depth:	Latitude: ° ' " N Datum: Longitude: ° ' " W	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #: 07 UT KA 50	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape: Scarp	Landform:	Microfeature:	Anthro:	Elevation:	Aspect: WNW 292	Slope (%): 16	Slope Complexity: Complex	Slope Shape: (Up & Dn / Across) Convex / Convex

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Somewhat Well	Flooding: NO	Ponding: NO	Soil Moisture Status: S. M.	Permeability: K_{sat}: Mod slow	Land Cover / Use: Range

Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: Shale	Lithostrat. Units: Group: Formation: Member: Tropic	

Erosion: Kind: Flow Pattern Degree: Mod	Runoff: Mod Rapid	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Paralithic Ochric 19"	

P. S. Control Section: Depth Range: 10-19"	Ave. Clay %: 55% (lab)	Ave. Rock Frag %: 0

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Ut Juniper	
	Pinyon Pine	
	Black sage	
	Indian Ricegrass	

MISCELLANEOUS FIELD NOTES / SKETCH:

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Component Name: Cannonville | Map Unit Symbol: | Date: Apr 5, 2007

	Obser. Method	Depth (in)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SS	0-4	A	CS	2.5Y 6/2	2.5Y 4/2	C	—	1 m sbk / 2 fgr	sh	vfr	s	s	—
2	↓	4-11	C1	CS	2.5Y 6/2	2.5Y 4/2	C	—	m	H	fi	s	s	—
3		11-19	C2	CS	2.5Y 6/2	2.5Y 4/2	C	—	m (shale structure)	H	fi	s	p	—
4		19+	Cr											
5														
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vf 1fm	2vfit	7.8	ST	45		
2	—	—	—	2vf 1fm	1vft	8.0	ST	55		
3	—	—	—	1vff	1vft	8.4	we	50		
4										
5										
6										
7										
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 51 | Draft | Mar-02

Series or Component Name: L	Map Unit Symbol:	Photo #:	Classification: Calcidic Haplustalf fine-loamy, mix, sesq, mesic	Soil Moist. Regime (Tax.):

Describer(s): Bob Long	Date: 9-24-07	Weather: Clear	Temp.: Air: 45° Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum: 10	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape: BS	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: S	Slope (%): 2-3	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component: TR	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Well	Flooding: No	Ponding: No	Soil Moisture Status:	Permeability: Ksat: Mod slow	Land Cover / Use: Pasture

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: No	Runoff: Slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Argillic Calcic

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %:
Depth Range:

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	Pasture grass	

MISCELLANEOUS FIELD NOTES / SKETCH :

100 feet of fence near #47

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Component Name:		Map Unit Symbol:		Date: 9-24-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	SS	0-3"	A	CS		10YR 4/2	CL	—	1 m sbk 2 fmgr	sh	fr	ss	mp	—
2	SS	3-11"	Bt	as		10YR 4/2	CL	—	2 m sbk	h	fr	ms	mp	—
3	Aug	11-24	BtK	gs		10YR 5/3	CL	—	2fm sbk	h	fr	ms	mp	—
4	Aug	24-38	BK	as		10YR 5/4	SCL	—	2f sbk	h	fr	ss	sp	—
5	Aug	38-54	2BtK1	gs		10YR 5/3	CL	—	3 fm sbk	vh	fi	ms	mp	—
6	Aug	54-64	2BtK2			10YR 5/4	CL	—	2fm sbk			ms	mp	—
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1		—	—	3vf 2f	2vft	8.2	VS	28		
2		—	65 CLF PF/PO	3vf 2f	2vft	8.2	VS	34		
3		DIS TOT	35 CLF PF/Po	2vf 1f	1vft	8.4	ST	32		
4		12 f CAM	—	2vf 1f	2vft	8.4	VE	22		
5		15 fm CAM	45 CLF PF/Po	1vff	1vft	8.2	ST/VE	35		
6		10-12 f CAM TH	35 CLF PF/Po	1vf	1vft	8.4	VE	32		
7										
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 52 | Draft | Mar-02

Series or Component Name: E/O	Map Unit Symbol:	Photo #:	Classification: Aquic Calciustept fine-loamy, mixed, superactive, frigid	Soil Moist. Regime (Tax.):

Describer(s): Bob Long	Date: 9-24-07	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum: 1983	Location: Sec. T. R.

UTM: Zone: 12 mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:		

Landscape: BS	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: SSW	Slope (%): 2-3	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component: TR	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Well	Flooding: No	Ponding: No	Soil Moisture Status: SM / Dry / moist	Permeability: Ksat: Mod slow	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: — Degree: —	Runoff: very slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: calcic 12-24"

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 10-40" 29% 0%	aquic 24-62"

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	grass	
	wild Rose	

MISCELLANEOUS FIELD NOTES / SKETCH :

Alkaline area

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Component Name:		Map Unit Symbol:		Date: 9-24-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	SS	0-4"	A1	gs	2.5Y 6/1	2.5Y 4/1	L	—	2fmsbk 2fgr	sh	vfr	SS	sp	—
2	SS	4-12"	A2	cs	2.5Y 5/2	2.5Y 4/2	L	—	2msbk	h	fr	SS	sp	—
3	SS	12-24"	Bk	gs	10YR 7/4	10YR 5/4	SCL	—	2msbk	h	vfr	SS	sp	—
4	ang	24-32"	BK2	cs		10YR 5/4	CL	—	1fmsbk	h	fr	SS	sp	18-20% f 5YR 6/8
5	ang	32-38"	C1	gs		10YR 5/4	C	—	2fmsbk	h	fr	s	p	15-18% f 5YR 6/8
6	ang	38-54	C2g	gs		5Y 4/1	SiCL	—	2fsbk	h	fr	ms	mp	8% vf Gley1 6/10Y
7	ang	54-62	C3			2.5Y 4/2	SiCL	—	2fmsbk	h	fr	ms	mp	15 vff 2.5YR 7/6
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	2% vf visible salt	—	2vf 1fm	2vfit		ST	24		Slightly moist
2	—	3 salts visible	—	2vff 1m	2vft		ST	24		Slightly moist
3	—	8 vf-f CAM	—	2vf 1fm	1vft		ST	24		dry
4	—	—	—	2vf 1fm	1vft		ST	28		dry
5	—	—	—	1vf	1vft		SL	40		slightly mois
6	—	—	—	1vf	1vft		SL	30		moist
7	—	—	—	1vf	1vft		SL	34		moist
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 53 | Draft | Mar-02

Series or Component Name: Disturbed soil	Map Unit Symbol:	Photo #:	Classification: Aeric Epiaquept co-loamy, mixed, super, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 9-24-07	Weather: clear Temp.: Air: 55°F Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum: 1983	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad.:	Site ID: YR: State: County: Pedon #:	Soil Survey Area: ACD	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape:	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: SSW	Slope (%): 1	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: ~~w~~ Somewhat poorly	Flooding: Oc	Ponding: Oc	Soil Moisture Status: 0-27" SM 27+ Wm	Permeability: Ksat: mod	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: None	Runoff: Very slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth:

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 10-40" 16% 0%		

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	grass	
	wild rose	
	daisys	

MISCELLANEOUS FIELD NOTES / SKETCH :

Soil profile appears to be the result of organic layers developing around a spring.

Upper 27" could be result of local deposition or land leveling by man

Vegetation indicates disturbance

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Component Name:				Map Unit Symbol:			Date: 9-24-07

	Obser. Method	Depth (in)	Depth (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd	Rock Frag %	Rock Frag Rnd	Rock Frag Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	SS	1/2-0"		Oi	as	decomposing	needles leaves grass													—
		0-4"		A	as	10YR 5/2	10YR 3/2	L	—				1	fsbk		sh	vfr	ss	ps	
2	SS	4-9"		E	as	2.5Y 8/2	2.5Y 7/2	GRV SL	45 GR				SG			10	10	so	po	—
3	SS	9-22		C	as	2.5Y 7/1	2.5Y 6/1	SL	—				SG			10	10	so	po	5 vff 10YR 7/4
4	any	22-27"		2Oi/A	as	2.5Y 6/2	2.5Y 4/2	PT SL	—				m			sh	vfr	so	po	—
						Peat + soil														
5	any	27-38"		2Oe/E	as	2.5Y 8/2	2.5Y 6/2	PT SL	—				m			sh	vfr	so	po	—
						decomposing	peat													
6	any	38-60		2Cg		2.5Y 6/2	2.5Y 4/2	SiL	—				m			vh	fi	ss	sp	5 vff 10YR 6/6
7																				
8																				
9																				
10																				

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	—	—	3vf 2f 1m	2vfi	8.0	SL	23		slightly moist
2	—	—	—	2vff 1m	2vfi	8.2	ST	[illegible]		traverting granuls slightly moist
3	—	10 vff CAM	—	2vff 1m	2vfi	8.2	ST	16		slightly moist
4	—	—	—	2vff	3vfi	—	—	16		[illegible] moist
5	—	—	—	2vff	3vfi	—	—	16		moist
6	—	—	—	1vf	1vft	7.8	VS	24		WN
7										
8		OiA 40% mineral soil								
9		OeE 40% mineral soil								
10										

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PEDON DESCRIPTION

Pedon ID # : 54 | Draft | Mar-02

Series or Component Name: fine-loamy phase of "O"	Map Unit Symbol:	Photo #:	Classification: Fluvaquentic Epiaquept fine-loamy, mix, super, frigid	Soil Moist. Regime (Tax.):
Describer(s): Bob Long	Date: 9-24-07	Weather: Clear	Temp.: Air: 65 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:
Location: Sec. T. R.	UTM: Zone: mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area:
MLRA / LRU:	Transect: ID: Stop #: Interval:			

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect:	Slope (%):	Slope Complexity:	Slope Shape: (Up & Dn / Across)
					S	3	Simple	Linear / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: poorly	Flooding: No	Ponding: 0	Soil Moisture Status: Slightly	Permeability: Ksat: Slow
Land Cover / Use: Range / Grazing				

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree: No	Runoff: Slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind:	Diagnostic Horz. / Prop.: Kind: Depth:
P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 10-40" 29% 0%			

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	Wild rose	
	Arctic Rush	
	Mtn Brome	
	Daisy	

MISCELLANEOUS FIELD NOTES / SKETCH :

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Component Name:	fine-loamy "O"	Map Unit Symbol:		Date:	9-24-07

	Obser. Method	Depth (in)	Depth (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd	Rock Frag %	Rock Frag Rnd	Rock Frag Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles %	Mottles Sz	Mottles Cont.	Mottles Col	Mottles Mst	Mottles Shp	Mottles Loc
1	SS	0	3"	AO	CS	10YR 5/3	10YR 3/3	Peaty CL	—				2	f	gr	sh	vfr	ms	mp	—						
2	SS	3	11"	A	CS	2.5Y 6/1	2.5Y 4/1	CL	—				2	f	sbk	h	fr	ms	mp	—						
3	SS/Aug	11	19"	Bw	CS	2.5Y 6/2	2.5Y 4/2	CL	—				3	fm	sbk	h	fr	ms	mp	—						
4	Aug	19	38	BK1	gs	2.5Y 7/3	2.5Y 5/3	SiL	—				2	fm	sbk	h	fr	ss	sp	8%	f	vf	7.5YR 7/6			
5	Aug	32	38	Bk2	CS	2.5Y 6/3	2.5Y 5/3	CL	—				2	fm	sbk	h	fr	ms	mp	18%	f		7.5YR 7/6			
6	Aug	38	48	2Bt	gs	2.5Y 6/1	2.5Y 4/1	C	—				2	m	sbk	vh	vfi	vs	vp	28%	f	vf	7.5YR 6/6			
7	Aug	48	64	2BK		2.5Y 8/2	2.5Y 7/1	C	—				m			vh	fi	s	p	35	fm		7.5YR 6/6			
8																										
9																										
10																										

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	—	—	3vff 1m	2vfi		ST	30		
2	—	—	—	2vff 1m	1vft		ST	32		
3	—	—	45 CLF PO/PF	2vff 2m	1vft		ST	34		
4	—	15f CAM	—	2vff 2m	1vft		VE	26		
5	—	15f CAM	—	2vff 2m	1vft		VE	34		
6	—	—	70 CLF PF/PO	1vffm	1vft		me	50		
7	—	15fm CAM	—	1vf	1vft		ST	42		
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 55 | Draft | Mar-02

Series or Component Name: E	Map Unit Symbol:	Photo #:	Classification: Aridic Calciustept fine-loamy, mix, super, mesic	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 9-24-07	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.

UTM: Zone: 12 mE: mN:	Topo Quad.: Alton	Site ID: YR: 07 State: UT County: KA Pedon #: 55	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:		

Landscape:	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: N	Slope (%): 4	Slope Complexity:	Slope Shape: (Up & Dn / Across)

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage:	Flooding: No	Ponding: Ra	Soil Moisture Status:	Permeability: Ksat:	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Sheet Degree: SL	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Cambic 3-12"

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 10-40" 34% 0%	calcic 30-62"

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	field bindweed	
	Rabbitbrush	

MISCELLANEOUS FIELD NOTES / SKETCH :

Digitized by Google

Component Name:									Map Unit Symbol:					Date: 9-24-07
Obser. Method	Depth (In) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1 SS	0-3"	A	CS	10YR 5/2	10YR 4/3	L	—	1f sbk 2f gr	sh	vfr	ms	mp	—
2 SS	3-12"	BW	CS	10YR 6/3	10YR 4/2	CL	—	2 m sbk 3 f sbk	vh	fi	s	p	—
3 aug	12-30	BK1	gs	10YR 7/4	10YR 6/4	CL	—	2fmsbk	h	fr	ms	p	—
4 aug	30-41	BK2	CS	10YR 7/4	10YR 6/4	CL	—	2fmsbk	h	fr	ms	mp	—
5 aug	41-53	BK3	gs	10YR 6/4	10YR 5/4	CL	—	2fmsbk	h	fr	ms	mp	20 f 7.5YR 7/6
6 aug	53-62	BK4		10YR 7/4	10YR 5/4	SCL	—	2 m sbk	h	fr	ms	mp	35 f 10YR 7/6
7													
8													
9													
10													

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	—	—	2vf 1fm	2vfi	7.8	me	27		
2	—	—	—	2vf 1fm	1vf+	7.9	me	38		
3	—	8-10f CAM	—	2vf 1fm	1vf+	8.2	ST	36		
4	—	15f CAM	—	2vf 1fm	1vf+	8.4	VE	34		
5	—	12-15f CAM	—	1vff	1vf+	8.4	VE	33		
6	—	12-15f CAM	—	1vf	1vf+	8.4	VE	30		
7										
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 56 | Draft | Mar-02

Series or Component Name: J	Map Unit Symbol:	Photo #:	Classification: Calcidic Argiustoll fine-loamy, mixed, super, mesic	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 9-25-07	Weather: Clear	Temp.: Air: 40° Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:
Location: Sec. T. R.				

UTM: Zone: mE: mN:	Topo Quad.:	Site ID: YR: State: County: Pedon #:	Soil Survey Area: ACD	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape:	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: SSE 160°	Slope (%): 5	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Convex

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Well	Flooding: No	Ponding: No	Soil Moisture Status: SM 0-10" Dry 10"+	Permeability: Ksat: Mod	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: None	Runoff: mod slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Argillic 4-32" Calcic 10-96"

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 4-24 3, 20	

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	ARTRW	
	Galletta grass	
	Cheatgrass	
	Serviceberry	
	Thistle	

MISCELLANEOUS FIELD NOTES / SKETCH :

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Component Name:	J	Map Unit Symbol:		Date:	9-25-07

	Obser. Method	Depth (in)	Depth (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd	Rock Frag %	Rock Frag Rnd	Rock Frag Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles %	Mottles Sz	Mottles Cont.	Mottles Col	Mottles Mst	Mottles Shp	Mottles Loc
1	Pit	0	4"	A	cs		10YR3/2	SCL	—				1	m	sbk	sh	vfr	ss	sp	—						
													2	f	gr											
2	Pit	4	10"	Bt	cs		10YR3/2	SCL	—				2	fm	sbk	sh	vfr	ss	sp	—						
3	Pit	10	32"	Btk	cs	10YR6/3	10YR4/3	CL	—				2	m	sbk	h	fr	ms	mp	—						
4	Pit	32	64"	BK1	gs	10YR7/3	10YR5/4	SCL	—				2	m	sbk	vh	fi	ms	mp	—						
5	Pit	64	96"	BK2		10YR7/4	10YR6/4	SL	—				2	m	sbk	h										
6																										
7																										
8																										
9																										
10																										

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1		—	—	3vf 2f 1mc	2vfi	8.2	vs	24		
2		—	25 CLF PF/BR	2vff 1mc	2vft	8.3	vs	28		
3		4-5% vff CAM	20 CLF PF/BR	2vff 1m	1vft	8.4	st	32		
4		18-20% f-m CAM	—	1vff	1vft	8.6	ve	30		
5		18-20% f-m CAM	—	1vf	1vft	8.6	ve	15		
6										
7										
8										
9										
10										

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PEDON DESCRIPTION

Pedon ID # : 57 | Draft | Mar-02

Series or Component Name: E	Map Unit Symbol:	Photo #:	Classification: Aridic Calciustept fine-loamy, mixed, super, mesic	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 9-25-07	Weather: Clear Temp.: Air: 50°F Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum: 1983	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area: ACD	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape:	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: NW 315°	Slope (%): 2-3	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Concave / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Well to 88"	Flooding: No	Ponding: Ra	Soil Moisture Status:	Permeability: Ksat: mod	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: sheet Degree: SL	Runoff: slow	Surface Frag %: GR: — CB: — ST: — BD: — CN: — FL: — Kind:	Diagnostic Horz. / Prop.: Kind: Cambic Depth: 4-10"

P.S. Control Section: Ave. Clay %: Depth Range: 10-40"	Ave. Rock Frag %: 26% 0%		Calcic

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	Arctic Rush	
	Poa	

MISCELLANEOUS FIELD NOTES / SKETCH :

Buried soil at 24"

fine-loamy Calciustept over co-loamy Calciustept

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Component Name:		Map Unit Symbol:		Date: 9-25-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	Pit	0-4"	A	cs		10YR 4/2	CL	—	1 fm sbk 2 fgr	sh	vfr	ms	mp	—
2	Pit	4-10"	Bw	cs		10YR 4/3	CL	—	2 fm sbk	sh	vfr	ms	mp	—
3	Pit	10-24"	Bk	as		7.5YR 6/4	SCL	—	2 m sbk	h	fr	ms	mp	—
4	Pit	24-34	2A	cw		10YR 4/2	L	—	3 m sbk	vh	fr	ss	sp	—
5	Pit	34-52"	2 BK1	gs		10YR 5/4	SL	—	2 ms sbk	vh	fr	so	sp	—
6	Pit	52-88"	2BK2	cs		10YR 5/4	SL	—	2 mc sbk	h	fr	so	po	—
7	Pit	88-100"	2Cg			2.5Y 6/4	SCL	—	m	h	fr	ss	sp	35 fm 2.5Y 7/1
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	—	—	3vf 2f 1m	2vfi	8.3	ST	32		moist
2	—	—	—	2vff 1m	2vft	8.4	SL	32		moist
3	—	40 f CAM	—	2vff 1m	1vft	8.4	me	30		dry
4	—	—	—	2vff 1m	1vft	8.2	VS	24		dry
5	—	15-18 fm CAM	—	2vff	1vft	8.2	VE	18		dry
6	—	6f CAM	—	1vf	1vft		ST	15		moist
7	—	—	—	1vf	1vft		me	25		moist
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

Pedon ID # : 58 | Draft | Mar-02

Series or Component Name: 5	Map Unit Symbol:	Photo #:	Classification: Aridic Haplustalf fine, mixed, super, mesic	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 9-25-07	Weather: Clear Temp.: Air: 52 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.

UTM: Zone: mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area: ACD	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape:	Landform: Valley Sideslope	Microfeature:	Anthro:	Elevation:	Aspect: ENE 75°	Slope (%): 7	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear / Linear	
Hillslope Profile Position: Backslope	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:		

Drainage: Well	Flooding: No	Ponding: No	Soil Moisture Status:	Permeability: Ksat: Very slow	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: Degree: Sheet mod	Runoff: Mod Rapid	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: argillic

P.S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range: 4-24" 47% 0%	

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	Black sage	
	Indian Ricegrass	

MISCELLANEOUS FIELD NOTES / SKETCH :

Profile very similar to #48.

No bulk samples collected.

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Component Name:		Map Unit Symbol:		Date: 9-25-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	Pit	0-4"	A	CS	2.5Y 6/2	2.5Y 5/2	CL	—	1 m pl / 2 fgr	h	fi	s	P	—
2	Pit	4-14"	Bt	CW		2.5Y 4/2	C	—	2 m pr / 3 m abk	Vh	vfi	VS	VP	—
3	Pit	14-32"	Btk	CW		2.5Y 5/2	C	—	2 m pr / 3 m abk	Xh	xfi	VS	VP	—
4	Pit	32-52"	Bty1	CW		2.5Y 5/3	C	—	3 m abk	Xh	xfi	VS	VP	—
5	Pit	52-64"	Bty2			2.5Y 5/3	C	—	2 m abk	Xh	xfi	VS	VP	—
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Notes
1	—	—		2vf 1fm	2vft	7.8	SL	35		
2	—	—	90 CLF PF/PO	2vff 1m	1vft	8.0	VS	44		
3	—	35 fm CAM	95 CLF PF/PO	2vf 1f 1m	—	6.9	ST	50+		
4	—	1f gyp Crystals PF	95 CLF PF/PO	1vf	—	8.4	VS	50+		
5	—	3 fm gyp masses on PF	95 CLF PF/PO	—	—	8.4	SL	50+		
6										
7										
8										
9										
10										

USDA-NRCS

PEDON DESCRIPTION

Pedon ID # : 59 | Draft | Mar-02

Series or Component Name: A	Map Unit Symbol:	Photo #:	Classification: Aridic Calciustept, Fine, mixed, super, mesic	Soil Moist. Regime (Tax.): Ustic
Describer(s): Bob Long	Date: 9-25-07	Weather: Clear	Temp.: Air: 55 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:
Location: Sec. T. R.	UTM: Zone: mE: mN:	Topo Quad.: Alton	Site ID: YR: State: County: Pedon #:	Soil Survey Area: ACD
MLRA / LRU:	Transect: ID: Stop #: Interval:			

Landscape:	Landform: Valley	Microfeature:	Anthro:	Elevation:	Aspect: SSW	Slope (%): 1-2	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Linear Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage: Well to 62" poorly >62"	Flooding: No	Ponding: Oc	Soil Moisture Status:	Permeability: Ksat: slow	Land Cover / Use: Range / Grazing

Parent Material: Alluvium	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree: None	Runoff: Very slow	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: — — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: Cambic 3-10" Calcic 10-45"

P.S. Control Section: Ave. Clay %: Depth Range: 10-40"	Ave. Rock Frag %: 37%	0%

VEGETATION :

SYMBOL	COMMON NAME	%GD COVER
	grasses (grazed short)	
	no shrubs	

MISCELLANEOUS FIELD NOTES / SKETCH :

This area appears white on aerial photo.

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Component Name:				Map Unit Symbol:				Date: 9-25-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frag Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cont. Col Mst Shp Loc
1	Pit	0-3"	A	cs	10YR 6/2	10YR 3/3	L	—	2fgr	sh	vfr	ss	sp	—
2	Pit	3-10"	2Bw	cs	10YR 5/2	10YR 3/2	CL	—	2msbk	sh	vfr	ms	mp	—
3	Pit	10-21"	2BK1	gs	10YR 6/4	10YR 5/4	CL	—	2mpr ~~2fsbk~~	h	fr	ms	mp	—
4	Pit	21-45"	2BK2	as	10YR 7/3	10YR 6/3	C	—	3msbk	vh	fi	s	p	—
5	Pit	45-53"	3A	cw	2.5Y 6/2	2.5Y 4/2	CL	—	2msbk	h	fr	ms	mp	—
6	Pit	53-62"	3Cy	cs	10YR 7/3	10YR 6/3	SCL	—	2msbk	vh	fi	ss	sp	—
7	Pit	62-76"	3Cg		2.5Y 7/4	2.5Y 6/4	SCL	—	m	h	fr	ss	sp	40 mc 7.5YR 6/6
8														
9														
10					free water accumulating					@ 75"				

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer. (agent)	Clay %	CCE	Field ECe	Notes
1	—	—	—	3vfzf	2vfi		me	27		mmhos/cm 0.39	
2	—	—	—	2vff	2vfi		me	30		0.96	
3	—	8-10 fm CAM	—	2vf 1f	1vft		VE	32		1.30	
4	—	12 fm CAM	—	2vf 1f	1vft		ST	40		0.73	
5	—	—	—	1vff	1vft		SL	34		0.65	
6	—	1vf gyp crystals	—	1vf	2vfi		ST	26		0.60	
7	35f 2.5Y 7/1	—	—	—	2vfi		me	22		0.85	
8											
9											
10											

USDA [illegible] **PEDON DESCRIPTION** PEDON ID #: 60 [illegible] 3/2002

Series or Component Name:	Map Unit Symbol:	Photo #:	Classification:	Soil Moisture Regime (Tax.):
S			Aridic Haplustalf fine, mixed, superactive,	Ustic

Describer(s):	Date:	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N	Datum:	Location: Sec. T. R.
Bob Long	9-25-07			Longitude: ° ' " W		

UTM: Zone: mE: mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:
	Alton				

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect:	Slope (%):	Slope Complexity:	Slope Shape: (Up & Dn / Across)
	Valley side slope				E 100	4-6	Simple	Convex / Linear

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:
Backslope							

Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability:	Land Cover / Use:
Well	No	No	5" to 26"	K_{sat}: Very slow	

Parent Material:	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind:	Diagnostic Horz. / Prop.: Kind: Depth:
sheet mod		— — — — — —	argillic

P. S. Control Section: Depth Range:	Ave. Clay %:	Ave. Rock Frag %:

VEGETATION :

SYMBOL	COMMON NAME	GD. COVER
	Utah Juniper	60%
	Pinyon Pine	40%
	Black sage	
	no grasses	

MISCELLANEOUS FIELD NOTES / SKETCH :

correlate with #48 and 58

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Component Name: | **Map Unit Symbol:** | **Date:** 9-25-07

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Lc
1	Pit	0-3"	A	CS			CL	—	1 m sbk / 2 f gr	h	fr	ms	mp	—
2	Pit	3-12"	Bt1	CS			C	—	2 m pr / 3 fm sbk	vh	fi	s	p	—
3	Pit	12-26"	Bt2	CS			C	—	2 m pr / 3 m sbk	xh	vfi	vs	vp	—
4	Pit	26-48"	BtK	CS			C	—	3 m sbk	xh	vfi	vs	vp	—
5		48" +	Cr		black shale									
6					stopped at 48" because profile is similar to pits									
7					48 & 58, and very difficult to move any									
8					more soil among trees									
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped/V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	2vf fmc	2vfit		vs	35		
2	—	—	85 CLF PF/PO	2vff 1mc	1vft		vs	42		
3	—	—	95 CLF PF/PO	2vff 1mc	1vft		SL	50+		
4	—	30 fm CAM	95 CLF PF/PO	2vf if 1mc	1vft		ST	50+		
5										
6										
7										
8										
9										
10										

Appendix C of Appendix 2-1

Soils Laboratory Data

(Water extractable Selenium analysis for CH-01, CH-03 and CH-06 is located in Appendix 6-2)

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Div. of Oil, Gas & Mining

Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
1YR-9A 0-12"	9.0	0.91	0.30	60	32	8	SL	26.6	47.0	0.12	4.7	2.5	0.11	26.1	†	†	0.98	7.93	0.62	0.65	4.23	10.0	6.90
1YR-9A 12-24"	9.1	0.83	0.23	68	22	10	SL	22.2	32.8	0.12	1.4	0.7	0.17	22.0	†	†	0.44	7.78	0.46	0.71	0.21	2.02	7.94
1YR-9A 24-42"	9.6	1.26	3.71	68	22	10	SL	20.4	26.4	0.12	0.3	0.2	0.18	23.6	†	†	0.76	6.48	7.06	0.34	0.13	2.22	10.6
1YR-9A 42-70"	9.4	0.90	3.19	69	21	10	SL	26.7	27.7	0.12	0.3	0.2	0.17	23.5	†	†	0.63	3.77	4.73	0.16	0.26	1.88	5.22
1YR-9A 70-100"	8.5	1.31	1.48	30	31	39	CL	27.3	68.6	0.19	0.5	0.3	0.22	9.8	†	†	1.72	8.32	3.31	0.19	0.29	0.82	2.82
1YR-9B 0-6"	8.0	0.62	0.07	44	32	24	L	14.5	63.0	0.16	6.1	3.2	0.09	18.6	†	†	2.19	3.21	0.12	0.74	1.73	1.44	4.49
1YR-9B 6-14"	8.2	0.34	0.21	52	25	23	SCL	18.1	42.4	0.17	3.4	1.8	0.22	15.3	†	†	1.17	1.67	0.25	0.30	0.91	<0.01	2.30
1YR-9B 14-28"	8.5	0.88	0.57	64	22	14	SL	9.7	35.7	0.12	0.9	0.5	0.17	21.2	†	†	1.16	5.71	1.06	0.72	0.50	<0.01	3.03
1YR-9B 28-48"	8.3	0.76	0.70	54	30	16	SL	16.0	31.0	0.12	0.4	0.2	0.22	26.4	†	†	1.49	4.64	1.23	0.37	0.48	<0.01	2.40
1YR-10 0-7"	7.8	0.46	0.05	36	38	26	L	17.9	46.4	0.16	3.9	2.1	0.15	19.2	0.29	<0.02	3.39	0.89	0.08	0.30	3.15	7.45	4.18
1YR-10 7-13"	7.7	0.40	0.06	26	48	26	L	12.3	44.4	0.16	2.4	1.3	0.29	13.9	0.31	<0.02	2.58	0.80	0.08	0.24	0.46	0.67	3.13
1YR-10 13-26"	7.9	0.34	0.07	14	52	34	SiCL	9.4	41.7	0.18	1.6	0.8	0.37	27.8	0.20	<0.02	2.00	0.95	0.09	0.21	0.44	0.37	3.03
1YR-10 26-44"	8.3	0.36	0.16	30	36	34	CL	29.1	45.4	0.19	1.0	0.5	0.25	35.5	0.37	<0.02	0.83	2.50	0.20	0.08	0.15	<0.01	3.55
1YR-10 44-68"	8.5	0.34	0.49	14	54	32	SiCL	7.0	46.0	0.18	0.5	0.3	0.42	34.4	0.24	<0.02	0.71	2.07	0.58	0.05	0.19	<0.01	2.51
1YR-10 68-84"	8.4	0.46	0.48	60	30	10	SL	24.5	28.0	0.12	0.2	0.1	0.24	26.4	0.07	<0.02	0.77	2.96	0.66	0.05	0.32	0.67	2.93
1YR-11 0-5"	8.0	0.48	0.19	72	19	9	SL	19.9	36.3	0.12	2.4	1.3	0.07	1.4	†	†	2.44	1.84	0.28	0.39	1.58	8.21	3.76
1YR-11 5-16"	8.2	0.50	0.28	69	17	14	SL	20.0	31.3	0.12	1.7	0.9	0.13	4.2	†	†	2.76	1.42	0.40	0.36	0.13	0.82	3.55
1YR-11 16-32"	8.3	0.38	0.22	72	18	10	SL	16.1	27.9	0.12	0.9	0.5	0.15	14.4	†	†	1.89	0.87	0.26	0.37	0.20	1.53	3.13
1YR-11 32-48"	8.3	0.41	0.26	79	13	8	LS	17.1	27.3	0.08	0.5	0.3	0.12	19.6	†	†	1.90	1.06	0.32	0.29	0.23	0.44	2.93
1YR-11 48-72"	8.6	0.33	0.24	78	14	8	LS	18.4	28.1	0.08	0.3	0.2	0.13	21.7	†	†	1.44	0.96	0.27	0.12	0.12	2.20	2.82
1YR-11 72-90"	8.7	0.29	0.35	89	7	4	S	14.1	23.9	0.05	0.2	0.1	0.08	18.2	†	†	1.37	1.15	0.39	0.13	0.10	4.93	2.19
1YR-12 0-5"	7.8	0.38	0.13	32	40	28	CL	28.9	46.8	0.19	2.3	1.2	0.20	0.1	†	†	2.66	0.91	0.17	0.20	0.87	7.33	3.03
1YR-12 5-10"	7.8	0.29	0.59	29	39	32	CL	22.2	50.6	0.19	1.9	1.0	0.26	9.3	†	†	1.79	0.69	0.66	0.08	0.67	0.22	2.51
1YR-12 10-26"	8.4	0.21	2.20	16	40	44	SiC	13.8	58.6	0.20	0.7	0.4	0.30	18.8	†	†	0.50	0.24	1.34	0.04	0.94	<0.01	1.99
1YR-12 26-44"	8.3	0.86	6.84	46	19	35	SC	45.0	93.0	0.19	0.7	0.4	0.19	11.9	†	†	0.91	0.57	5.89	0.08	0.20	<0.01	1.67
SP-13 0-6"	8.5	0.72	0.17	59	23	18	SL	15.8	34.1	0.12	2.7	1.4	0.08	19.7	†	†	4.77	2.10	0.31	0.90	3.78	39.5	5.64
SP-13 6-12"	8.2	0.52	0.22	23	51	26	SiL	12.7	43.3	0.18	1.7	0.9	0.32	27.9	†	†	2.64	1.72	0.33	0.41	0.18	3.83	3.87
SP-13 12-24"	8.4	0.55	0.23	14	44	42	SiC	9.1	62.3	0.20	2.9	1.5	0.29	26.9	†	†	1.67	3.09	0.35	0.26	0.50	0.70	3.87
SP-13 24-48"	8.5	0.47	0.29	22	46	32	CL	9.5	46.3	0.19	1.2	0.6	0.31	32.2	†	†	0.91	3.26	0.42	0.12	0.46	0.44	3.55
SP-13 48-60"	8.8	0.31	0.51	33	39	28	CL	13.4	46.1	0.19	1.8	0.9	0.27	29.2	†	†	0.53	3.00	0.67	0.10	0.17	<0.01	1.67
SP-13 60-72"	8.9	1.46	2.20	62	14	24	SCL	19.2	35.6	0.17	1.2	0.6	0.18	20.6	†	†	1.64	8.30	4.90	0.14	0.23	0.99	7.00
SP-13 72-84"	8.7	2.20	2.36	44	36	20	L	18.5	33.5	0.16	0.5	0.3	0.25	28.7	†	†	2.07	15.5	7.00	0.20	0.29	0.73	3.03
SP-14 0-6"	8.7	0.54	0.14	8	48	44	SiC	5.3	58.6	0.20	4.0	2.1	0.21	7.5	†	†	2.34	2.42	0.22	0.35	0.38	8.92	4.81
SP-14 6-13"	7.8	0.36	0.22	8	48	44	SiC	5.7	62.4	0.20	2.1	1.1	0.31	19.9	†	†	1.08	2.05	0.27	0.17	0.58	2.94	2.61
SP-14 13-28"	8.1	0.53	0.49	23	50	27	CL	21.4	50.7	0.19	0.7	0.4	0.36	44.0	†	†	0.41	3.76	0.70	0.14	0.17	4.40	4.28
SP-14 28-48"	8.7	0.77	1.35	40	43	17	L	33.6	43.7	0.16	0.4	0.2	0.34	39.3	†	†	0.49	5.04	2.24	0.10	0.21	2.67	3.55
SP-14 48-70"	8.8	0.80	1.60	21	40	39	CL	5.6	41.7	0.19	0.4	0.2	0.24	30.9	†	†	0.54	4.79	2.61	0.11	0.41	3.54	5.12
SP-14 70-90"	8.5	0.89	1.28	21	47	32	CL	17.7	55.0	0.19	0.6	0.3	0.32	31.5	†	†	0.74	3.87	1.94	0.11	0.64	0.31	2.61

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Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
LOF-1 0-6"	7.3	1.56	0.23	25	39	36	CL	20.1	50.2	0.19	3.6	1.9	0.16	22.6	†	†	9.03	2.09	0.55	2.20	1.99	2.86	3.76
LOF-1 6-12"	8.3	0.52	1.15	26	38	36	CL	24.3	54.4	0.19	1.8	0.9	0.25	27.1	†	†	2.63	1.09	1.57	0.18	<0.02	0.18	3.45
LOF-1 12-24"	8.5	0.42	2.91	18	40	42	SiC	16.5	54.8	0.20	1.6	0.8	0.29	26.6	†	†	1.07	0.59	2.65	0.07	0.23	0.93	2.72
LOF-1 24-42"	8.7	0.90	4.02	13	41	46	SiC	11.3	60.8	0.20	1.5	0.8	0.28	27.1	†	†	1.61	0.87	4.47	0.14	0.34	<0.01	4.08
LOF-1 42-60"	8.4	4.75	12.3	19	39	42	C	17.1	65.4	0.19	1.1	0.6	0.29	28.3	†	†	6.45	7.65	32.7	0.45	0.21	0.07	1.67
LOF-2 0-7"	7.6	0.47	0.16	32	37	31	CL	14.9	43.3	0.19	2.7	1.4	0.17	18.6	0.27	<0.02	4.93	1.26	0.29	0.65	1.58	9.55	3.13
LOF-2 7-12"	7.7	0.31	0.19	34	34	32	CL	22.3	44.8	0.19	2.4	1.3	0.23	20.1	0.24	<0.02	2.07	0.68	0.22	0.19	0.55	0.40	2.19
LOF-2 12-24"	7.8	0.25	0.62	14	40	46	SiC	12.4	60.2	0.20	1.8	0.9	0.28	26.7	0.30	<0.02	1.29	0.57	0.59	0.09	0.31	<0.01	2.19
LOF-2 24-48"	8.0	0.32	2.12	22	37	41	C	20.2	67.7	0.19	1.7	0.9	0.23	26.9	0.45	<0.02	0.77	0.53	1.71	0.07	0.88	0.04	1.88
LOF-2 48-72"	7.8	7.38	7.27	14	43	43	SiC	11.3	66.7	0.20	1.1	0.6	0.30	27.5	1.08	0.09	23.8	24.9	35.8	0.50	1.07	0.40	1.25
LOF-2 72-96"	7.8	7.17	7.75	18	35	47	C	13.0	62.9	0.19	1.1	0.6	0.26	21.0	0.61	0.12	21.6	26.3	37.9	0.47	13.1	0.76	0.94
LOF-3 0-4"	8.1	0.82	0.27	32	42	26	L	17.5	47.7	0.16	3.9	2.1	0.16	20.3	†	†	5.98	1.58	0.53	1.02	10.6	<0.01	5.64
LOF-3 4-11"	8.3	0.43	0.25	24	48	28	CL	15.9	51.8	0.19	2.9	1.5	0.30	20.4	†	†	3.19	0.73	0.36	0.27	1.07	0.90	3.55
LOF-3 11-19"	8.1	0.41	0.32	16	50	34	SiCL	14.0	42.7	0.18	2.3	1.2	0.35	24.2	†	†	2.86	0.88	0.44	0.22	0.43	0.56	2.51
LOF-3 19-33"	8.4	0.71	4.05	17	43	40	SiC	16.1	53.5	0.20	2.2	1.2	0.30	27.2	†	†	1.67	0.89	4.58	0.15	0.32	0.07	3.87
LOF-4 0-5"	7.8	0.62	0.29	12	46	42	SiC	9.1	52.6	0.20	3.5	1.8	0.22	22.5	†	†	4.54	1.04	0.49	0.26	4.16	0.79	3.03
LOF-4 5-10"	7.7	0.31	0.26	14	46	40	SiC	11.0	53.0	0.20	2.8	1.5	0.30	24.4	†	†	2.28	0.63	0.32	0.08	0.66	9.76	2.72
LOF-4 10-19"	7.8	0.33	0.60	12	43	45	SiC	10.5	53.9	0.20	2.1	1.1	0.29	25.3	†	†	2.00	0.78	0.71	0.08	0.53	0.64	2.40
LOF-4 19-31"	7.9	0.29	1.16	13	43	44	SiC	11.3	53.6	0.20	1.8	0.9	0.29	25.3	†	†	1.12	0.52	1.05	0.06	0.40	0.67	1.88
LOF-4 31-50"	7.8	4.06	5.43	19	39	42	C	16.3	59.8	0.19	1.1	0.6	0.29	27.6	†	†	16.3	12.4	20.5	0.51	1.06	0.43	1.46
RDV-5 0-5"	8.1	0.54	0.27	38	44	18	L	22.6	42.7	0.16	3.6	1.9	0.20	25.7	†	†	3.72	0.90	0.41	0.36	6.14	10.4	3.97
RDV-5 5-10"	8.1	0.50	0.19	33	47	20	L	18.9	39.3	0.16	3.0	1.6	0.29	26.4	†	†	3.98	0.95	0.30	0.23	<0.02	1.82	4.08
RDV-5 10-25"	8.4	0.37	0.31	54	32	14	SL	19.0	32.3	0.12	1.1	0.6	0.23	31.1	†	†	2.37	0.89	0.40	0.22	0.22	16.4	2.72
RDV-5 25-48"	8.8	0.72	7.45	16	72	12	SiL	13.4	56.0	0.18	1.7	0.9	#N/A	28.0	†	†	0.84	0.60	6.33	0.11	0.16	1.48	4.91
RDV-5 48-60"	9.0	3.37	24.0	31	47	22	L	26.6	83.6	0.16	1.3	0.7	0.32	26.5	†	†	1.26	1.76	29.5	0.20	0.22	1.62	6.06
RDV-6 0-6"	8.1	0.52	0.34	82	12	6	LS	21.0	27.9	0.08	1.1	0.6	0.04	18.4	†	†	2.99	1.06	0.48	0.77	1.68	9.41	3.97
RDV-6 6-12"	8.3	0.31	0.25	80	14	6	LS	18.5	29.9	0.08	0.7	0.4	0.13	20.6	†	†	2.13	0.47	0.28	0.14	0.24	0.67	2.51
RDV-6 12-24"	8.0	0.64	0.20	45	37	18	L	17.8	35.4	0.16	2.6	1.4	0.25	28.9	†	†	4.52	1.68	0.36	0.33	<0.02	0.56	4.18
RDV-6 24-34"	8.3	0.40	0.30	69	23	8	SL	35.5	29.7	0.12	0.7	0.4	0.19	29.2	†	†	2.43	1.35	0.41	0.18	0.07	0.56	2.93
RDV-6 34-60"	8.5	0.83	3.43	19	41	40	SiC	15.5	52.9	0.20	1.8	0.9	0.30	25.9	†	†	1.83	2.24	4.89	0.19	0.03	<0.01	5.96
RDV-7 0-6"	7.5	0.58	0.13	26	38	36	CL	20.4	62.9	0.19	4.4	2.3	0.14	10.6	†	†	3.93	1.17	0.20	0.28	2.19	12.5	3.76
RDV-7 6-12"	7.6	0.36	0.22	18	38	44	C	11.9	57.1	0.19	3.0	1.6	0.26	13.2	†	†	2.37	0.78	0.27	0.09	0.28	7.78	2.82
RDV-7 12-24"	8.0	0.24	1.30	16	37	47	C	13.6	55.3	0.19	1.8	0.9	0.26	21.2	†	†	0.82	0.44	1.04	0.04	0.40	0.73	2.09
RDV-7 24-60"	8.0	1.40	5.18	22	34	44	C	20.8	63.8	0.19	1.4	0.7	0.26	23.4	†	†	2.65	2.00	7.90	0.11	0.30	0.46	1.78
1YR-8 0-8"	8.0	0.68	0.18	36	34	30	CL	19.7	51.5	0.19	5.8	3.1	0.12	5.1	†	†	3.68	2.81	0.33	0.45	3.82	10.9	5.54
1YR-8 8-14"	8.1	0.53	0.18	38	32	30	CL	17.2	43.1	0.19	2.1	1.1	0.23	16.3	†	†	3.22	1.63	0.29	0.34	0.05	0.07	2.93
1YR-8 14-22"	8.5	0.40	0.43	48	30	22	L	19.5	35.8	0.16	1.1	0.6	0.22	27.3	†	†	1.77	1.31	0.53	0.37	0.17	0.21	2.30
1YR-8 22-45"	8.9	0.44	0.28	42	42	16	L	23.9	37.6	0.16	0.7	0.4	0.33	30.8	†	†	0.71	3.05	0.39	0.45	0.50	2.51	3.55
1YR-8 45-65"	9.0	0.49	0.28	79	13	8	LS	19.8	27.4	0.08	0.4	0.2	0.12	19.3	†	†	0.70	3.46	0.40	0.41	0.27	0.18	3.66
1YR-8 65-85"	8.9	0.56	0.65	80	12	8	LS	17.9	25.9	0.08	0.3	0.2	0.11	20.4	†	†	1.24	3.81	1.03	0.19	0.20	0.10	4.18

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Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
SP-15 0-8"	8.0	0.54	0.08	52	32	16	SL	24.2	46.5	0.12	3.5	1.8	0.16	10.8	†	†	2.01	2.43	0.12	0.41	0.68	4.82	4.70
SP-15 8-20"	8.5	0.50	0.11	50	32	18	L	24.3	35.2	0.16	0.8	0.4	0.21	27.6	†	†	0.70	3.80	0.17	0.31	0.16	1.80	4.60
SP-15 20-37"	8.7	0.78	0.72	51	34	15	L	23.7	30.7	0.16	0.5	0.3	0.27	31.9	†	†	0.64	5.91	1.30	0.21	0.58	1.56	4.08
SP-15 37-58"	8.6	1.56	1.81	39	43	18	L	22.7	36.9	0.16	0.4	0.2	0.33	33.4	†	†	0.90	12.0	4.60	0.18	0.32	1.20	3.03
SP-15 58-73"	8.4	3.35	1.92	74	18	8	SL	19.2	27.2	0.12	0.1	0.1	0.15	26.3	†	†	2.52	33.5	8.14	0.26	0.36	0.82	1.99
SP-15 73-96"	8.3	1.77	1.24	52	34	14	SL	25.3	30.2	0.12	0.3	0.2	0.26	28.1	†	†	1.70	12.4	3.30	0.19	0.54	<0.01	2.82
SP-16 0-8"	8.3	0.58	0.31	19	45	36	SiCL	15.1	64.5	0.18	4.8	2.5	0.21	9.6	†	†	3.08	1.84	0.49	0.42	1.19	18.3	4.81
SP-16 8-18"	8.2	0.60	0.25	12	44	44	SiC	10.8	61.9	0.20	1.9	1.0	0.30	24.5	†	†	2.00	2.77	0.39	0.28	0.21	4.70	3.55
SP-16 18-36"	8.7	0.45	0.38	20	52	28	CL	16.2	50.6	0.19	0.6	0.3	0.37	38.8	†	†	0.68	3.12	0.53	0.19	0.24	6.45	4.18
SP-16 36-56"	9.0	0.34	0.56	14	58	28	SiCL	12.4	52.2	0.18	0.6	0.3	0.46	40.1	†	†	0.45	3.38	0.77	0.14	0.23	5.10	3.66
SP-16 56-68"	8.9	0.60	0.78	50	36	14	L	21.6	36.3	0.16	0.3	0.2	0.30	28.1	†	†	0.52	4.30	1.21	0.16	0.30	2.83	4.08
SP-16 68-96"	8.9	0.53	0.81	23	49	28	CL	17.0	55.3	0.19	0.6	0.3	0.36	31.0	†	†	1.00	3.49	1.21	0.18	0.24	1.25	4.81
WRD-17 0-9"	7.8	0.43	0.11	22	42	36	CL	11.0	49.8	0.19	4.6	2.4	0.22	25.4	†	†	1.74	1.11	0.14	0.51	1.09	8.05	3.34
WRD-17 9-18"	8.0	0.24	0.17	34	34	32	CL	16.6	39.6	0.19	2.0	1.1	0.20	25.3	†	†	1.14	0.63	0.16	0.23	0.28	1.26	1.78
WRD-17 18-30"	8.0	0.32	0.11	44	34	22	L	17.3	38.5	0.16	1.6	0.8	0.23	25.3	†	†	0.99	0.69	0.10	0.15	0.85	2.49	2.61
WRD-17 30-45"	8.1	0.28	0.13	36	37	27	CL	17.5	39.3	0.19	0.8	0.4	0.27	29.5	†	†	0.59	0.56	0.10	0.05	0.10	2.82	2.40
WRD-17 45-60"	8.2	0.34	0.22	24	44	32	CL	14.8	40.0	0.19	0.8	0.4	0.31	33.5	†	†	1.17	1.64	0.26	0.07	0.11	0.13	2.19
WRD-17 60-80"	8.0	0.82	0.37	18	40	42	SiC	17.0	61.3	0.20	1.1	0.6	0.30	33.0	†	†	2.86	4.00	0.69	0.14	0.59	0.70	1.88
WRD-18A 0-7"	7.7	0.61	0.10	41	33	26	L	18.3	46.0	0.16	3.9	2.1	0.17	20.2	†	†	3.08	1.36	0.15	0.59	0.57	1.95	3.97
WRD-18A 7-15"	8.0	0.33	0.12	43	33	24	L	20.0	43.4	0.16	2.1	1.1	0.19	24.7	†	†	1.45	1.00	0.13	0.28	0.68	0.61	2.30
WRD-18A 15-30	8.1	0.51	0.29	60	23	17	SL	17.6	31.1	0.12	0.7	0.4	0.15	28.2	†	†	1.97	2.13	0.41	0.09	0.08	2.43	2.30
WRD-18A 30-45	8.0	0.67	0.30	24	41	35	CL	13.8	52.4	0.19	1.5	0.8	0.28	29.3	†	†	2.66	3.06	0.51	0.12	0.13	0.34	1.88
WRD-18A 45-60	7.9	0.44	0.36	57	23	20	SCL	18.4	36.1	0.17	0.7	0.4	0.23	25.8	†	†	1.67	1.63	0.47	0.06	0.16	<0.01	2.09
WRD-18B 0-9"	8.2	0.35	0.18	34	40	26	L	11.4	43.4	0.16	3.6	1.9	0.16	23.8	0.39	<0.02	4.56	1.75	0.31	0.65	3.96	18.6	5.54
WRD-18B 9-19"	8.3	0.61	0.17	50	30	20	L	16.2	41.3	0.16	1.8	0.9	0.22	20.3	0.25	<0.02	3.45	1.56	0.27	0.80	0.31	2.89	4.60
WRD-18B 19-34	8.5	0.52	0.21	44	38	18	L	21.0	35.8	0.16	1.2	0.6	0.28	27.5	0.18	<0.02	2.41	2.17	0.31	0.18	0.09	5.50	3.13
WRD-18B 34-54	8.7	0.38	0.27	21	47	32	CL	13.4	45.5	0.19	1.4	0.7	0.31	29.0	0.33	<0.02	1.63	1.70	0.35	0.12	0.50	0.93	2.61
WRD-18B 54-72	8.6	0.57	0.31	22	44	34	CL	11.8	49.6	0.19	1.1	0.6	0.29	28.3	0.29	<0.02	1.92	2.53	0.46	0.18	0.10	1.19	3.76
WRD-18B 72-96	8.6	1.46	0.56	48	32	20	L	21.2	34.7	0.16	0.5	0.3	0.25	23.1	0.19	<0.02	2.97	11.0	1.48	0.19	0.45	0.21	8.99
WRD-19 0-6"	8.0	0.91	0.15	34	42	24	L	16.5	48.5	0.16	4.9	2.6	0.15	20.1	†	†	4.87	2.07	0.28	1.72	2.77	12.9	6.69
WRD-19 6-12"	8.2	0.65	0.20	32	36	32	CL	13.1	44.1	0.19	3.0	1.6	0.23	17.4	†	†	3.43	1.45	0.30	1.14	1.85	8.32	4.39
WRD-19 12-24"	8.3	0.53	0.23	34	36	30	CL	15.8	40.8	0.19	2.0	1.1	0.25	23.5	†	†	2.85	1.21	0.32	0.87	0.67	1.99	2.51
WRD-19 24-37"	8.5	0.55	0.19	49	29	22	L	24.5	40.8	0.16	1.9	1.0	0.21	24.6	†	†	2.71	1.11	0.26	0.76	0.35	0.99	3.13
WRD-19 37-51"	8.4	0.57	0.18	60	26	14	SL	24.2	34.1	0.12	1.2	0.6	0.19	22.7	†	†	2.94	1.39	0.27	0.59		1.53	2.40
WRD-19 51-68"	8.5	0.48	0.26	66	22	12	SL	17.5	29.1	0.12	0.8	0.4	0.17	19.7	†	†	2.07	1.87	0.36	0.22	0.41	1.71	3.45
WRD-19 68-90"	8.7	0.37	0.30	71	19	10	SL	17.6	26.0	0.12	0.6	0.3	0.16	19.8	†	†	1.11	2.06	0.37	0.10	0.18	1.88	2.93
WRD-20 0-6"	7.9	0.57	0.08	39	37	24	L	15.4	53.3	0.16	6.6	3.5	0.20	18.4	†	†	2.75	1.83	0.12	0.58	0.19	0.94	4.49
WRD-20 6-13"	7.8	0.56	0.10	41	29	30	CL	17.7	47.6	0.19	2.4	1.3	0.16	20.8	†	†	2.47	1.47	0.14	0.67	0.12	1.62	3.13
WRD-20 13-28"	8.1	0.27	0.14	69	21	10	SL	18.6	24.1	0.12	0.6	0.3	0.15	25.4	†	†	1.22	0.63	0.13	0.32	0.07	0.37	2.30
WRD-20 28-54"	8.0	0.32	0.07	79	14	7	LS	15.8	25.4	0.08	0.2	0.1	0.03	21.7	†	†	1.40	0.76	0.07	0.42	0.03	0.94	2.72
WRD-20 54-72"	8.1	0.27	0.23	45	29	26	L	13.9	38.5	0.16	1.1	0.6	0.22	24.3	†	†	1.18	0.87	0.24	0.21	0.53	1.23	2.51
WRD-20 72-96"	8.2	0.32	0.16	82	13	5	LS	17.6	28.3	0.08	0.3	0.2	0.02	16.5	†	†	0.97	1.23	0.16	0.28	0.29	0.28	2.51

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Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
ID	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
WRD-21 0-8"	8.4	0.46	0.19	61	11	28	SCL	18.6	30.6	0.17	2.0	1.1	0.16	21.2	†	†	2.94	0.74	0.26	0.48	2.30	7.11	3.76
WRD-21 8-18"	8.1	0.66	0.17	59	11	30	SCL	47.0	46.0	0.17	3.2	1.7	0.15	29.8	†	†	4.12	1.78	0.29	0.20	0.75	0.87	4.08
WRD-21 18-36"	8.4	0.49	0.22	68	18	14	SL	18.2	30.5	0.12	1.2	0.6	0.14	20.3	†	†	2.64	1.61	0.33	0.10	0.26	2.48	2.72
WRD-21 36-50"	8.7	0.48	0.24	67	25	8	SL	14.2	28.6	0.12	0.9	0.5	0.20	21.6	†	†	2.71	1.62	0.36	0.15	0.35	0.79	3.34
WRD-21 50-62"	8.7	0.37	0.25	69	23	8	SL	14.8	27.9	0.12	1.0	0.5	0.18	16.8	†	†	1.91	1.24	0.32	0.12	0.46	2.66	2.51
WRD-21 62-96"	8.7	0.32	0.25	68	20	12	SL	23.7	26.7	0.12	0.7	0.4	0.06	20.7	†	†	1.34	1.60	0.30	0.09	0.17	1.07	2.51
WRD-22 0-6"	7.7	0.40	0.07	63	23	14	SL	25.0	36.6	0.12	1.8	0.9	0.26	20.2	†	†	2.16	0.88	0.08	0.35	1.94	4.52	3.13
WRD-22 6-15"	7.7	0.34	0.13	19	42	39	SiCL	7.0	48.0	0.18	3.7	1.9	0.30	23.8	†	†	1.85	0.83	0.16	0.19	0.76	9.01	2.72
WRD-22 15-28"	8.0	0.29	0.11	47	27	26	SCL	5.6	34.9	0.17	1.2	0.6	0.22	18.9	†	†	1.64	0.80	0.13	0.18	0.80	0.31	2.72
WRD-22 28-48"	8.0	0.25	0.14	65	21	14	SL	13.7	28.0	0.12	0.8	0.4	0.16	17.9	†	†	1.18	0.64	0.13	0.16	0.29	0.13	2.30
WRD-22 48-60"	8.0	0.27	0.10	65	21	14	SL	14.5	30.1	0.12	1.0	0.5	0.16	17.5	†	†	1.34	0.67	0.10	0.16	0.35	0.07	2.30
WRD-22 60-84"	8.2	0.30	0.09	74	18	8	SL	21.8	27.3	0.12	0.5	0.3	0.15	21.0	†	†	1.08	0.96	0.09	0.25	0.57	0.28	2.51
WRD-23 0-6"	7.7	0.60	0.05	31	38	31	CL	12.5	48.4	0.19	4.9	2.6	0.22	21.4	†	†	3.20	1.35	0.07	0.53	1.43	8.26	4.60
WRD-23 6-12"	7.9	0.38	0.13	36	33	31	CL	14.7	44.6	0.19	2.9	1.5	0.19	23.6	†	†	1.97	0.91	0.15	0.30	0.31	1.74	3.34
WRD-23 12-22"	7.9	0.35	0.12	38	34	28	CL	12.5	41.0	0.19	1.8	0.9	0.23	25.6	†	†	1.76	0.92	0.14	0.16	0.29	1.09	3.24
WRD-23 22-40"	8.0	0.24	0.16	51	30	19	L	17.2	33.2	0.16	0.7	0.4	0.22	29.8	†	†	1.12	0.77	0.15	0.06	0.21	1.03	2.30
WRD-23 40-62"	8.2	0.23	0.24	31	44	25	L	20.0	38.6	0.16	0.6	0.3	0.31	35.3	†	†	1.01	0.94	0.24	0.06	0.89	0.28	1.99
WRD-23 62-80"	8.1	0.44	0.48	18	41	41	SiC	14.0	43.9	0.20	0.8	0.4	0.31	30.4	†	†	1.61	1.95	0.64	0.14	0.35	1.65	2.09
DAH-24 0-5"	7.6	0.26	0.53	34	19	47	C	33.0	73.6	0.19	1.3	0.7	0.17	2.9	0.23	<0.02	1.25	0.58	0.50	0.09	4.14	2.25	1.57
DAH-24 5-17"	7.7	0.43	1.32	42	14	44	C	41.4	84.1	0.19	1.2	0.6	0.19	8.7	0.42	<0.02	1.62	0.65	1.40	0.09	0.19	0.16	1.88
DAH-24 17-32"	8.1	7.79	10.0	38	17	45	C	36.5	91.2	0.19	0.9	0.5	0.20	5.0	0.73	<0.02	18.7	30.7	49.9	0.54	0.09	<0.01	1.88
DAH-25 0-5"	6.4	0.21	0.55	32	28	40	C	21.1	58.5	0.19	3.3	1.7	0.25	1.7	†	†	0.98	0.62	0.49	0.08	3.85	6.80	0.52
DAH-25 5-13"	7.0	0.33	0.21	30	23	47	C	21.6	80.6	0.19	2.4	1.3	0.20	30.3	†	†	1.90	0.68	0.23	0.13	0.20	0.19	1.36
DAH-25 13-20"	7.2	0.28	0.23	30	24	46	C	20.7	73.5	0.19	2.1	1.1	0.19	39.4	†	†	1.44	0.44	0.22	0.12	0.29	1.32	1.88
DAH-25 20-32"	7.7	0.26	0.25	48	19	33	SCL	37.6	54.1	0.17	1.2	0.6	0.19	3.8	†	†	1.34	0.52	0.25	0.09	0.15	0.43	1.88
SP-28 0-8"	7.7	0.47	0.65	7	38	55	C		60.2	0.12	2.5	1.3		18.9	†	†	2.8	2.3	1.0	1.00	3.9	<5	†
SP-28 8-24"	8.0	0.48	1.50	9	34	57	C		65.4	0.12	1.4	0.7		17.6	†	†	1.8	2.4	2.2	0.77	1.6	<5	†
SP-28 24-48	8.1	5.94	5.50	4	36	60	C		72.6	0.11	1.0	0.5		18.5	†	†	13	42	29	0.77	2.8	<5	†
SP-35 0-9"	7.7	0.56	0.11	12	44	44	SiC		55.4	0.14	4.3	2.3		16.7	†	†	4.0	2.7	0.20	1.80	5.1	45	†
SP-35 9-19"	7.9	0.44	0.12	16	40	44	SiC		54.6	0.14	1.8	0.9		17.4	†	†	2.4	2.3	0.19	1.60	1.1	25	†
SP-35 19-30"	8.2	0.40	0.22	51	27	22	SCL		31.5	0.12	1.2	0.6		15.0	†	†	1.5	1.8	0.28	1.10	1.1	5	†
SP-35 30-45"	8.4	0.37	0.22	59	27	14	SL		30.5	0.10	0.8	0.4		17.7	†	†	0.98	1.4	0.23	0.70	1.1	<5	†
SP-35 45-70"	8.8	0.46	0.37	42	39	19	L		37.3	0.14	0.9	0.5		18.0	†	†	0.73	1.4	0.37	1.30	1.0	<5	†
SP-37 0-6"	7.8	0.51	0.08	38	30	32	CL		46.7	0.13	4.0	2.1		4.5	†	†	5.1	2.1	0.16	0.83	3.9	10	†
SP-37 6-12"	7.7	0.44	0.09	48	23	29	SCL		45.4	0.12	2.9	1.5		7.5	†	†	4.2	1.8	0.16	0.71	6.5	<5	†
SP-37 12-24"	8.0	0.29	0.13	56	24	20	SL-SCL		38.7	0.11	3.0	1.6		11.1	†	†	2.3	1.4	0.18	0.35	1.9	<5	†
SP-37 24-38"	8.2	0.25	0.14	71	18	11	SL		35.2	0.08	0.7	0.4		15.3	†	†	1.6	1.7	0.18	0.10	2.0	<5	†
SP-37 38-58"	8.2	0.27	0.34	73	18	9	SL		30.3	0.07	0.5	0.2		17.3	†	†	1.5	2.0	0.44	0.07	1.5	<5	†
SP-38 0-6"	8.0	0.47	0.09	12	44	44	SiC		69.9	0.14	6.2	3.3		24.7	†	†	3.2	3.4	0.17	0.74	2.7	8	†
SP-38 6-12"	8.3	0.33	0.15	2	47	51	SiC		81.8	0.13	3.4	1.8		17.8	†	†	1.5	3.4	0.23	0.42	1.6	<5	†
SP-38 12-20"	8.5	0.49	0.39	11	46	43	SiC		71.1	0.15	1.9	1.0		28.3	†	†	1.3	5.2	0.70	0.23	1.4	<5	†
SP-38 20-24"	8.3	0.57	0.44	10	42	48	SiC		71.5	0.14	1.1	0.6		44.5	†	†	1.8	5.6	0.84	0.21	3.0	<5	†

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Table C-1. Summary of laboratory analysis of soil samples for Coal Hollow soil survey, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter	Organic Carbon (calculated)[3]	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
SP-39 0-6"	7.8	0.32	0.19	36	33	31	CL		43.7	0.14	2.3	1.2		8.5	†	†	3.1	1.2	0.27	0.45	2.1	6	†
SP-39 6-12"	7.8	0.38	0.21	38	30	32	CL		41.9	0.13	2.4	1.3		7.9	†	†	3.9	1.5	0.34	0.45	1.7	<5	†
SP-39 12-24"	8.0	0.23	0.24	62	20	18	SL		35.3	0.09	1.2	0.6		13.9	†	†	2.2	0.98	0.30	0.17	1.2	<5	†
SP-39 24-36"	7.9	0.20	0.17	75	15	10	SL		32.3	0.06	0.5	0.3		14.4	†	†	1.7	1.0	0.20	0.09	1.2	<5	†
SP-40 0-6"	8.0	0.53	0.47	10	42	48	SiC		85.8	0.13	5.7	3.0		14.4	†	†	2.3	4.6	0.86	1.10	1.5	11	†
SP-40 6-12"	8.4	1.81	1.01	5	44	51	SiC		88.4	0.13	2.9	1.5		18.0	†	†	3.1	20	3.6	0.50	1.1	6	†
SP-40 12-22"	9.0	1.29	1.46	21	44	35	CL		76.1	0.15	1.4	0.7		19.9	†	†	0.51	14	4.1	0.26	1.1	6	†
SP-41 0-6"	8.0	0.46	0.12	46	26	28	SCL		51.3	0.12	3.3	1.7		14.5	†	†	3.9	1.7	0.20	1.10	1.4	8	†
SP-41 6-12"	8.0	0.53	0.15	25	34	41	C		54.9	0.14	3.4	1.8		12.1	†	†	4.4	2.7	0.27	1.50	4.7	6	†
SP-41 12-36"	8.1	0.22	0.15	6	44	50	SiC		69.0	0.13	1.7	0.9		16.6	†	†	1.4	1.6	0.19	0.69	1.1	<5	†
SP-41 36-64"	8.2	0.43	0.40	12	52	36	SiCL		63.9	0.16	1.0	0.5		18.5	†	†	1.4	3.9	0.65	0.41	1.1	<5	†
SP-41 64-80"	8.8	0.66	1.63	54	31	15	SL		31.5	0.12	0.6	0.3		17.3	†	†	0.67	5.7	2.9	0.15	1.2	<5	†
SP-42 0-9"	7.9	0.33	0.10	50	30	20	L		42.8	0.12	2.4	1.3		18.0	†	†	3.7	0.97	0.16	0.42	3.9	5	†
SP-42 9-24"	8.1	0.28	0.19	8	49	43	SiC		60.9	0.15	2.6	1.4		18.5	†	†	2.5	1.3	0.26	0.81	3.5	<5	†
SP-42 24-36"	8.3	0.32	0.20	52	27	21	SCL		44.7	0.12	1.7	0.9		16.0	†	†	2.3	2.9	0.31	0.36	1.5	<5	†
SP-42 36-48"	8.6	0.28	1.14	44	34	22	L		31.4	0.13	0.9	0.5		18.2	†	†	0.94	1.8	1.3	0.43	1.4	<5	†
SP-48 0-3"	7.7	0.52	0.92	7	33	60	C	4.8	85.6	0.10	3.5	1.8	0.22	4.5	†	<0.001	3.60	1.30	1.40	0.19	2.60	10	†
SP-48 3-12"	8.0	0.57	4.68	6	30	64	C	5.3	95.4	0.16	1.9	1.0	0.21	7.2	†	<0.001	1.20	0.55	4.40	0.06	1.10	8	†
SP-48 12-30"	8.2	2.63	11.20	12	28	60	C	11.0	106.0	0.10	1.7	0.9	0.23	7.5	†	<0.001	3.00	1.80	17.00	0.13	1.30	7	†
SP-48 30-48"	8.1	4.65	12.70	10	28	62	C	9.5	81.0	0.11	1.6	0.8	0.23	5.2	†	<0.001	6.50	4.10	29.00	0.23	<1.0	7	†
SP-48 48-84"	7.9	6.20	10.80	7	30	63	C	6.5	87.5	0.11	1.5	0.8	0.22	4.0	†	<0.001	15.00	8.10	37.00	0.35	1.40	9	†
SP-49 0-3"	8.1	0.42	0.05	20	49	31	SiCL	4.8	58.0	0.11	2.0	1.1	0.05	17.8	†	†	2.90	1.50	0.07	0.31	<1.0	7	†
SP-49 3-10"	8.4	0.34	0.06	26	47	27	CL-L	5.3	55.5	0.12	2.3	1.2	0.09	17.7	†	†	2.00	1.50	0.08	0.34	<1.0	8	†
SP-50 0-4"	8.4	0.20	0.13	5	37	58	C	11.0	75.4	0.12	1.4	0.7	0.08	18.5	†	†	1.60	0.36	0.13	0.22	1.40	6	†
SP-50 4-11"	8.1	0.27	0.29	<1.0	39	61	C	9.5	66.2	0.12	1.3	0.7	0.14	18.7	†	†	1.90	0.53	0.32	0.24	1.40	8	†
SP-50 11-19"	8.4	0.30	0.52	6	39	55	C	6.5	72.0	0.12	1.4	0.7	0.14	18.5	†	†	1.90	0.59	0.57	0.18	1.30	9	†

1. Usda soil textures: sand (S); loamy sand (LS); sandy loam (SL); loam (L); clay loam (CL); sandy clay loam (SCL); silty clay loam (SiCL); silty clay (SiC); clay (C).
2. Available water capacity calculated using using *Soil Water Characteristics Model* (Saxton et al., 1986).
3. Organic carbon calculated from percent organic matter.
4.Erodibility factor (K) calculated from lab and field data

Suitability Rating (Table 4. Utah DOGM, 2005): Good Fair Poor Unacceptable

Undable to calculate because referenced calcualtion in Table 7, Footnote # 3 above is invalid for soils with percent silt + fine sand greater than 70 percent.

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0610051

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0610051-001	LOF-2	0-7	7.6	43.3	0.47	2.7	4.93	1.26	0.29	0.65	0.16
S0610051-002	LOF-2	7-12	7.7	44.8	0.31	2.4	2.07	0.68	0.22	0.19	0.19
S0610051-003	LOF-2	12-24	7.8	60.2	0.25	1.8	1.29	0.57	0.59	0.09	0.62
S0610051-004	LOF-2	24-48	8.0	67.7	0.32	1.7	0.77	0.53	1.71	0.07	2.12
S0610051-005	LOF-2	48-72	7.8	66.7	7.38	1.1	23.8	24.9	35.8	0.50	7.27
S0610051-006	LOF-2	72-96	7.8	62.9	7.17	1.1	21.6	26.3	37.9	0.47	7.75
S0610051-007	LOF-4	0-5	7.8	52.6	0.62	3.5	4.54	1.04	0.49	0.26	0.29
S0610051-008	LOF-4	5-10	7.7	53.0	0.31	2.8	2.28	0.63	0.32	0.08	0.26
S0610051-009	LOF-4	10-19	7.8	53.9	0.33	2.1	2.00	0.78	0.71	0.08	0.60
S0610051-010	LOF-4	19-31	7.9	53.6	0.29	1.8	1.12	0.52	1.05	0.06	1.16
S0610051-011	LOF-4	31-50	7.8	59.8	4.06	1.1	16.3	12.4	20.5	0.51	5.43
S0610051-012	RDV-7	0-6	7.5	62.9	0.58	4.4	3.93	1.17	0.20	0.28	0.13
S0610051-013	RDV-7	6-12	7.6	57.1	0.36	3.0	2.37	0.78	0.27	0.09	0.22
S0610051-014	RDV-7	12-24	8.0	55.3	0.24	1.8	0.82	0.44	1.04	0.04	1.30
S0610051-015	RDV-7	24-60	8.0	63.8	1.40	1.4	2.65	2.00	7.90	0.11	5.18
S0610051-016	1YR-9	0-6	8.0	63.0	0.62	6.1	2.19	3.21	0.12	0.74	0.07
S0610051-017	1YR-9	6-14	8.2	42.4	0.34	3.4	1.17	1.67	0.25	0.30	0.21
S0610051-018	1YR-9	14-28	8.5	35.7	0.88	0.9	1.16	5.71	1.06	0.72	0.57
S0610051-019	1YR-9	28-48	8.3	31.0	0.76	0.4	1.49	4.64	1.23	0.37	0.70
S0610051-020	1YR-10	0-7	7.8	46.4	0.46	3.9	3.39	0.89	0.08	0.30	0.05

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0610051-001	LOF-2	0-7	32.0	37.0	31.0	Clay Loam	14.9	0.27	1.58	9.55	<0.02
S0610051-002	LOF-2	7-12	34.0	34.0	32.0	Clay Loam	22.3	0.24	0.55	0.40	<0.02
S0610051-003	LOF-2	12-24	14.0	40.0	46.0	Silty Clay	12.4	0.30	0.31	<0.01	<0.02
S0610051-004	LOF-2	24-48	22.0	37.0	41.0	Clay	20.2	0.45	0.88	0.04	<0.02
S0610051-005	LOF-2	48-72	14.0	43.0	43.0	Silty Clay	11.3	1.08	1.07	0.40	0.09
S0610051-006	LOF-2	72-96	18.0	35.0	47.0	Clay	13.0	0.61	13.1	0.76	0.12
S0610051-007	LOF-4	0-5	12.0	46.0	42.0	Silty Clay	9.1		4.16	0.79	
S0610051-008	LOF-4	5-10	14.0	46.0	40.0	Silty Clay	11.0		0.66	9.76	
S0610051-009	LOF-4	10-19	12.0	43.0	45.0	Silty Clay	10.5		0.53	0.64	
S0610051-010	LOF-4	19-31	13.0	43.0	44.0	Silty Clay	11.3		0.40	0.67	
S0610051-011	LOF-4	31-50	19.0	39.0	42.0	Clay	16.3		1.06	0.43	
S0610051-012	RDV-7	0-6	26.0	38.0	36.0	Clay Loam	20.4		2.19	12.5	
S0610051-013	RDV-7	6-12	18.0	38.0	44.0	Clay	11.9		0.28	7.78	
S0610051-014	RDV-7	12-24	16.0	37.0	47.0	Clay	13.6		0.40	0.73	
S0610051-015	RDV-7	24-60	22.0	34.0	44.0	Clay	20.8		0.30	0.46	
S0610051-016	1YR-9	0-6	44.0	32.0	24.0	Loam	14.5		1.73	1.44	
S0610051-017	1YR-9	6-14	52.0	25.0	23.0	Sandy Clay Loam	18.1		0.91	<0.01	
S0610051-018	1YR-9	14-28	64.0	22.0	14.0	Sandy Loam	9.7		0.50	<0.01	
S0610051-019	1YR-9	28-48	54.0	30.0	16.0	Sandy Loam	16.0		0.48	<0.01	
S0610051-020	1YR-10	0-7	36.0	38.0	26.0	Loam	17.9	0.29	3.15	7.45	<0.02

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter·Mountain Laboratories, Inc.

Soil Analysis Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S0610051.001

Date: 11/14/2006

Work Order: S0610051

Project: Talon Resources Soil

Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0610051-021	1YR-10	7-13	26.0	48.0	26.0	Loam	12.3	0.31	0.46	0.67	<0.02
S0610051-022	1YR-10	13-26	14.0	52.0	34.0	Silty Clay Loam	9.4	0.20	0.44	0.37	<0.02
S0610051-023	1YR-10	26-44	30.0	36.0	34.0	Clay Loam	29.1	0.37	0.15	<0.01	<0.02
S0610051-024	1YR-10	44-68	14.0	54.0	32.0	Silty Clay Loam	7.0	0.24	0.19	<0.01	<0.02
S0610051-025	1YR-10	68-84	60.0	30.0	10.0	Sandy Loam	24.5	0.07	0.32	0.67	<0.02
S0610051-026	1YR-12	0-5	32.0	40.0	28.0	Clay Loam	28.9		0.87	7.33	
S0610051-027	1YR-12	5-10	29.0	39.0	32.0	Clay Loam	22.2		0.67	0.22	
S0610051-028	1YR-12	10-26	16.0	40.0	44.0	Silty Clay	13.8		0.94	<0.01	
S0610051-029	1YR-12	26-44	46.0	19.0	35.0	Sandy Clay	45.0		0.20	<0.01	
S0610051-030	SP-14	0-6	8.0	48.0	44.0	Silty Clay	5.3		0.38	8.92	
S0610051-031	SP-14	6-13	8.0	48.0	44.0	Silty Clay	5.7		0.58	2.94	
S0610051-032	SP-14	13-28	23.0	50.0	27.0	Clay Loam	21.4		0.17	4.40	
S0610051-033	SP-14	28-48	40.0	43.0	17.0	Loam	33.6		0.21	2.67	
S0610051-034	SP-14	48-70	21.0	40.0	39.0	Clay Loam	5.6		0.41	3.54	
S0610051-045	SP-14	70-90	21.0	47.0	32.0	Clay Loam	17.7		0.64	0.31	
S0610051-036	DAH-24	0-5	34.0	19.0	47.0	Clay	33.0	0.23	4.14	2.25	<0.02
S0610051-037	DAH-24	5-17	42.0	14.0	44.0	Clay	41.4	0.42	0.19	0.16	<0.02
S0610051-038	DAH-24	17-32	38.0	17.0	45.0	Clay	36.5	0.73	0.09	<0.01	<0.02
S0610051-040	DAH-25	0-5	32.0	28.0	40.0	Clay	21.1		3.85	6.80	
S0610051-041	DAH-25	5-13	30.0	23.0	47.0	Clay	21.6		0.20	0.19	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

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OCT 15 2009

Div. of Oil, Gas & Mining

Inter·Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S06[illegible].001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-001	LOF-1	0-6	22.6	3.76
S0609512-002	LOF-1	6-12	27.1	3.45
S0609512-003	LOF-1	12-24	26.6	2.72
S0609512-004	LOF-1	24-42	27.1	4.08
S0609512-005	LOF-1	42-60	28.3	1.67
S0609512-006	LOF-3	0-4	20.3	5.64
S0609512-007	LOF-3	4-11	20.4	3.55
S0609512-008	LOF-3	11-19	24.2	2.51
S0609512-009	LOF-3	19-33	27.2	3.87
S0609512-011	RDV-5	0-5	25.7	3.97
S0609512-012	RDV-5	5-10	26.4	4.08
S0609512-013	RDV-5	10-25	31.1	2.72
S0609512-014	RDV-5	25-48	28.0	4.91
S0609512-015	RDV-5	48-60	26.5	6.06
S0609512-016	RDV-6	0-6	18.4	3.97
S0609512-017	RDV-6	6-12	20.6	2.51
S0609512-018	RDV-6	12-24	28.9	4.18
S0609512-019	RDV-6	24-34	29.2	2.93
S0609512-020	RDV-6	34-60	25.9	5.96
S0609512-021	1YR-8	0-8	5.1	5.54

These results apply only to the samples tested.

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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, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report

Talon Resources, Inc.

PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006

Work Order: S0609512

Project: Talon Resources Soil

Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0609512-022	1YR-8	8-14	38.0	32.0	30.0	Clay Loam	17.2		0.05	0.07	
S0609512-023	1YR-8	14-22	48.0	30.0	22.0	Loam	19.5		0.17	0.21	
S0609512-024	1YR-8	22-45	42.0	42.0	16.0	Loam	23.9		0.50	2.51	
S0609512-025	1YR-8	45-65	79.0	13.0	8.0	Loamy Sand	19.8		0.27	0.18	
S0609512-026	1YR-8	65-85	80.0	12.0	8.0	Loamy Sand	17.9		0.20	0.10	
S0609512-027	1YR-9A	0-12	60.0	32.0	8.0	Sandy Loam	26.6		4.23	10.0	
S0609512-028	1YR-9A	12-24	68.0	22.0	10.0	Sandy Loam	22.2		0.21	2.02	
S0609512-029	1YR-9A	24-42	68.0	22.0	10.0	Sandy Loam	20.4		0.13	2.22	
S0609512-030	1YR-9A	42-70	69.0	21.0	10.0	Sandy Loam	26.7		0.26	1.88	
S0609512-031	1YR-9A	70-100	30.0	31.0	39.0	Clay Loam	27.3		0.29	0.82	
S0609512-032	1YR-11	0-5	72.0	19.0	9.0	Sandy Loam	19.9		1.58	8.21	
S0609512-033	1YR-11	5-16	69.0	17.0	14.0	Sandy Loam	20.0		0.13	0.82	
S0609512-034	1YR-11	16-32	72.0	18.0	10.0	Sandy Loam	16.1		0.20	1.53	
S0609512-035	1YR-11	32-48	79.0	13.0	8.0	Loamy Sand	17.1		0.23	0.44	
S0609512-036	1YR-11	48-72	78.0	14.0	8.0	Loamy Sand	18.4		0.12	2.20	
S0609512-037	1YR-11	72-90	89.0	7.0	4.0	Sand	14.1		0.10	4.93	
S0609512-038	SP-13	0-6	59.0	23.0	18.0	Sandy Loam	15.8		3.78	39.5	
S0609512-039	SP-13	6-12	23.0	51.0	26.0	Silt Loam	12.7		0.18	3.83	
S0609512-040	SP-13	12-24	14.0	44.0	42.0	Silty Clay	9.1		0.50	0.70	
S0609512-041	SP-13	24-48	22.0	46.0	32.0	Clay Loam	9.5		0.46	0.44	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

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OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-022	1YR-8	8-14	16.3	2.93
S0609512-023	1YR-8	14-22	27.3	2.30
S0609512-024	1YR-8	22-45	30.8	3.55
S0609512-025	1YR-8	45-65	19.3	3.66
S0609512-026	1YR-8	65-85	20.4	4.18
S0609512-027	1YR-9A	0-12	26.1	6.90
S0609512-028	1YR-9A	12-24	22.0	7.94
S0609512-029	1YR-9A	24-42	23.6	10.6
S0609512-030	1YR-9A	42-70	23.5	5.22
S0609512-031	1YR-9A	70-100	9.8	2.82
S0609512-032	1YR-11	0-5	1.4	3.76
S0609512-033	1YR-11	5-16	4.2	3.55
S0609512-034	1YR-11	16-32	14.4	3.13
S0609512-035	1YR-11	32-48	19.6	2.93
S0609512-036	1YR-11	48-72	21.7	2.82
S0609512-037	1YR-11	72-90	18.2	2.19
S0609512-038	SP-13	0-6	19.7	5.64
S0609512-039	SP-13	6-12	27.9	3.87
S0609512-040	SP-13	12-24	26.9	3.87
S0609512-041	SP-13	24-48	32.2	3.55

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

OCT 15 2009
Div. of Oil, Gas & Mining

Inter·Mountain Laboratories, Inc.

Soil A[illegible]s Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible] 2001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0609512-042	SP-13	48-60	8.8	46.1	0.31	1.8	0.53	3.00	0.67	0.10	0.51
S0609512-043	SP-13	60-72	8.9	35.6	1.46	1.2	1.64	8.30	4.90	0.14	2.20
S0609512-044	SP-13	72-84	8.7	33.5	2.20	0.5	2.07	15.5	7.00	0.20	2.36
S0609512-045	SP-16	0-8	8.3	64.5	0.58	4.8	3.08	1.84	0.49	0.42	0.31
S0609512-046	SP-16	8-18	8.2	61.9	0.60	1.9	2.00	2.77	0.39	0.28	0.25
S0609512-047	SP-16	18-36	8.7	50.6	0.45	0.6	0.68	3.12	0.53	0.19	0.38
S0609512-048	SP-16	36-56	9.0	52.2	0.34	0.6	0.45	3.38	0.77	0.14	0.56
S0609512-049	SP-16	56-68	8.9	36.3	0.60	0.3	0.52	4.30	1.21	0.16	0.78
S0609512-050	SP-16	68-96	8.9	55.3	0.53	0.6	1.00	3.49	1.21	0.18	0.81
S0609512-051	WRD-18	0-9	8.2	43.4	0.35	3.6	4.56	1.75	0.31	0.65	0.18
S0609512-052	WRD-18	9-19	8.3	41.3	0.61	1.8	3.45	1.56	0.27	0.80	0.17
S0609512-053	WRD-18	19-34	8.5	35.8	0.52	1.2	2.41	2.17	0.31	0.18	0.21
S0609512-054	WRD-18	34-54	8.7	45.5	0.38	1.4	1.63	1.70	0.35	0.12	0.27
S0609512-055	WRD-18	54-72	8.6	49.6	0.57	1.1	1.92	2.53	0.46	0.18	0.31
S0609512-056	WRD-18	72-96	8.6	34.7	1.46	0.5	2.97	11.0	1.48	0.19	0.56
S0609512-057	WRD-19	0-6	8.0	48.5	0.91	4.9	4.87	2.07	0.28	1.72	0.15
S0609512-058	WRD-19	6-12	8.2	44.1	0.65	3.0	3.43	1.45	0.30	1.14	0.20
S0609512-059	WRD-19	12-24	8.3	40.8	0.53	2.0	2.85	1.21	0.32	0.87	0.23
S0609512-060	WRD-19	24-37	8.5	40.8	0.55	1.9	2.71	1.11	0.26	0.76	0.19
S0609512-061	WRD-19	37-51	8.4	34.1	0.57	1.2	2.94	1.39	0.27	0.59	0.18

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]2001
Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0609512-042	SP-13	48-60	33.0	39.0	28.0	Clay Loam	13.4		0.17	<0.01	
S0609512-043	SP-13	60-72	62.0	14.0	24.0	Sandy Clay Loam	19.2		0.23	0.99	
S0609512-044	SP-13	72-84	44.0	36.0	20.0	Loam	18.5		0.29	0.73	
S0609512-045	SP-16	0-8	19.0	45.0	36.0	Silty Clay Loam	15.1		1.19	18.3	
S0609512-046	SP-16	8-18	12.0	44.0	44.0	Silty Clay	10.8		0.21	4.70	
S0609512-047	SP-16	18-36	20.0	52.0	28.0	Clay Loam	16.2		0.24	6.45	
S0609512-048	SP-16	36-56	14.0	58.0	28.0	Silty Clay Loam	12.4		0.23	5.10	
S0609512-049	SP-16	56-68	50.0	36.0	14.0	Loam	21.6		0.30	2.83	
S0609512-050	SP-16	68-96	23.0	49.0	28.0	Clay Loam	17.0		0.24	1.25	
S0609512-051	WRD-18	0-9	34.0	40.0	26.0	Loam	11.4	0.39	3.96	18.6	<0.02
S0609512-052	WRD-18	9-19	50.0	30.0	20.0	Loam	16.2	0.25	0.31	2.89	<0.02
S0609512-053	WRD-18	19-34	44.0	38.0	18.0	Loam	21.0	0.18	0.09	5.50	<0.02
S0609512-054	WRD-18	34-54	21.0	47.0	32.0	Clay Loam	13.4	0.33	0.50	0.93	<0.02
S0609512-055	WRD-18	54-72	22.0	44.0	34.0	Clay Loam	11.8	0.29	0.10	1.19	<0.02
S0609512-056	WRD-18	72-96	48.0	32.0	20.0	Loam	21.2	0.19	0.45	0.21	<0.02
S0609512-057	WRD-19	0-6	34.0	42.0	24.0	Loam	16.5		2.77	12.9	
S0609512-058	WRD-19	6-12	32.0	36.0	32.0	Clay Loam	13.1		1.85	8.32	
S0609512-059	WRD-19	12-24	34.0	36.0	30.0	Clay Loam	15.8		0.67	1.99	
S0609512-060	WRD-19	24-37	49.0	29.0	22.0	Loam	24.5		0.35	0.99	
S0609512-061	WRD-19	37-51	60.0	26.0	14.0	Sandy Loam	24.2			1.53	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible].2001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-042	SP-13	48-60	29.2	1.67
S0609512-043	SP-13	60-72	20.6	7.00
S0609512-044	SP-13	72-84	28.7	3.03
S0609512-045	SP-16	0-8	9.6	4.81
S0609512-046	SP-16	8-18	24.5	3.55
S0609512-047	SP-16	18-36	38.8	4.18
S0609512-048	SP-16	36-56	40.1	3.66
S0609512-049	SP-16	56-68	28.1	4.08
S0609512-050	SP-16	68-96	31.0	4.81
S0609512-051	WRD-18	0-9	23.8	5.54
S0609512-052	WRD-18	9-19	20.3	4.60
S0609512-053	WRD-18	19-34	27.5	3.13
S0609512-054	WRD-18	34-54	29.0	2.61
S0609512-055	WRD-18	54-72	28.3	3.76
S0609512-056	WRD-18	72-96	23.1	8.99
S0609512-057	WRD-19	0-6	20.1	6.69
S0609512-058	WRD-19	6-12	17.4	4.39
S0609512-059	WRD-19	12-24	23.5	2.51
S0609512-060	WRD-19	24-37	24.6	3.13
S0609512-061	WRD-19	37-51	22.7	2.40

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

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OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0609512-062	WRD-19	51-68	8.5	29.1	0.48	0.8	2.07	1.87	0.36	0.22	0.26
S0609512-063	WRD-19	68-90	8.7	26.0	0.37	0.6	1.11	2.06	0.37	0.10	0.30
S0609512-064	WRD-21	0-8	8.4	30.6	0.46	2.0	2.94	0.74	0.26	0.48	0.19
S0609512-065	WRD-21	8-18	8.1	46.0	0.66	3.2	4.12	1.78	0.29	0.20	0.17
S0609512-066	WRD-21	18-36	8.4	30.5	0.49	1.2	2.64	1.61	0.33	0.10	0.22
S0609512-067	WRD-21	36-50	8.7	28.6	0.48	0.9	2.71	1.62	0.36	0.15	0.24
S0609512-068	WRD-21	50-62	8.7	27.9	0.37	1.0	1.91	1.24	0.32	0.12	0.25
S0609512-069	WRD-21	62-96	8.7	26.7	0.32	0.7	1.34	1.60	0.30	0.09	0.25

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

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Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report

Talon Resources, Inc.

PO Box 1230

Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006

Work Order: S0609512

Project: Talon Resources Soil

Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0609512-062	WRD-19	51-68	66.0	22.0	12.0	Sandy Loam	17.5		0.41	1.71	
S0609512-063	WRD-19	68-90	71.0	19.0	10.0	Sandy Loam	17.6		0.18	1.88	
S0609512-064	WRD-21	0-8	61.0	11.0	28.0	Sandy Clay Loam	18.6		2.30	7.11	
S0609512-065	WRD-21	8-18	59.0	11.0	30.0	Sandy Clay Loam	47.0		0.75	0.87	
S0609512-066	WRD-21	18-36	68.0	18.0	14.0	Sandy Loam	18.2		0.26	2.48	
S0609512-067	WRD-21	36-50	67.0	25.0	8.0	Sandy Loam	14.2		0.35	0.79	
S0609512-068	WRD-21	50-62	69.0	23.0	8.0	Sandy Loam	14.8		0.46	2.66	
S0609512-069	WRD-21	62-96	68.0	20.0	12.0	Sandy Loam	23.7		0.17	1.07	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten

Karen Barten, Soil Lab Supervisor

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OCT 15 2009

Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]12001

Date: 11/13/2006
Work Order: S0609512

Project: Talon Resources Soil
Date Received: 9/28/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0609512-062	WRD-19	51-68	19.7	3.45
S0609512-063	WRD-19	68-90	19.8	2.93
S0609512-064	WRD-21	0-8	21.2	3.76
S0609512-065	WRD-21	8-18	29.8	4.08
S0609512-066	WRD-21	18-36	20.3	2.72
S0609512-067	WRD-21	36-50	21.6	3.34
S0609512-068	WRD-21	50-62	16.8	2.51
S0609512-069	WRD-21	62-96	20.7	2.51

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]51001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Sodium meq/L	Potassium meq/L	SAR
S0610051-064	WRD-20	6-13	7.8	47.6	0.56	2.4	2.47	1.47	0.14	0.67	0.10
S0610051-065	WRD-20	13-28	8.1	24.1	0.27	0.6	1.22	0.63	0.13	0.32	0.14
S0610051-066	WRD-20	28-54	8.0	25.4	0.32	0.2	1.40	0.76	0.07	0.42	0.07
S0610051-067	WRD-20	54-72	8.1	38.5	0.27	1.1	1.18	0.87	0.24	0.21	0.23
S0610051-079	WRD-20	72-96	8.2	28.3	0.32	0.3	0.97	1.23	0.16	0.28	0.16
S0610051-068	WRD-22	0-6	7.7	36.6	0.40	1.8	2.16	0.88	0.08	0.35	0.07
S0610051-069	WRD-22	6-15	7.7	48.0	0.34	3.7	1.85	0.83	0.16	0.19	0.13
S0610051-070	WRD-22	15-28	8.0	34.9	0.29	1.2	1.64	0.80	0.13	0.18	0.11
S0610051-071	WRD-22	28-48	8.0	28.0	0.25	0.8	1.18	0.64	0.13	0.16	0.14
S0610051-072	WRD-22	48-60	8.0	30.1	0.27	1.0	1.34	0.67	0.10	0.16	0.10
S0610051-073	WRD-22	60-84	8.2	27.3	0.30	0.5	1.08	0.96	0.09	0.25	0.09
S0610051-074	WRD-23	0-6	7.7	48.4	0.60	4.9	3.20	1.35	0.07	0.53	0.05
S0610051-075	WRD-23	6-12	7.9	44.6	0.38	2.9	1.97	0.91	0.15	0.30	0.13
S0610051-076	WRD-23	12-22	7.9	41.0	0.35	1.8	1.76	0.92	0.14	0.16	0.12
S0610051-077	WRD-23	22-40	8.0	33.2	0.24	0.7	1.12	0.77	0.15	0.06	0.16
S0610051-078	WRD-23	40-62	8.2	38.6	0.23	0.6	1.01	0.94	0.24	0.06	0.24
S0610051-035	WRD-23	62-80	8.1	43.9	0.44	0.8	1.61	1.95	0.64	0.14	0.48

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

INCORPORATED
OCT 15 2009
Div. of Oil, Gas & Mining

Inter·Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S0[illegible]1001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	Sand %	Silt %	Clay %	Texture	Very Fine Sand %	Boron ppm	Nitrogen Nitrate ppm	Phosphorus ppm	Selenium ppm
S0610051-064	WRD-20	6-13	41.0	29.0	30.0	Clay Loam	17.7		0.12	1.62	
S0610051-065	WRD-20	13-28	69.0	21.0	10.0	Sandy Loam	18.6		0.07	0.37	
S0610051-066	WRD-20	28-54	79.0	14.0	7.0	Loamy Sand	15.8		0.03	0.94	
S0610051-067	WRD-20	54-72	45.0	29.0	26.0	Loam	13.9		0.53	1.23	
S0610051-079	WRD-20	72-96	82.0	13.0	5.0	Loamy Sand	17.6		0.29	0.28	
S0610051-068	WRD-22	0-6	63.0	23.0	14.0	Sandy Loam	25.0		1.94	4.52	
S0610051-069	WRD-22	6-15	19.0	42.0	39.0	Silty Clay Loam	7.0		0.76	9.01	
S0610051-070	WRD-22	15-28	47.0	27.0	26.0	Sandy Clay Loam	5.6		0.80	0.31	
S0610051-071	WRD-22	28-48	65.0	21.0	14.0	Sandy Loam	13.7		0.29	0.13	
S0610051-072	WRD-22	48-60	65.0	21.0	14.0	Sandy Loam	14.5		0.35	0.07	
S0610051-073	WRD-22	60-84	74.0	18.0	8.0	Sandy Loam	21.8		0.57	0.28	
S0610051-074	WRD-23	0-6	31.0	38.0	31.0	Clay Loam	12.5		1.43	8.26	
S0610051-075	WRD-23	6-12	36.0	33.0	31.0	Clay Loam	14.7		0.31	1.74	
S0610051-076	WRD-23	12-22	38.0	34.0	28.0	Clay Loam	12.5		0.29	1.09	
S0610051-077	WRD-23	22-40	51.0	30.0	19.0	Loam	17.2		0.21	1.03	
S0610051-078	WRD-23	40-62	31.0	44.0	25.0	Loam	20.0		0.89	0.28	
S0610051-035	WRD-23	62-80	18.0	41.0	41.0	Silty Clay	14.0		0.35	1.65	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

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Inter-Mountain Laboratories, Inc.

Soil Analysis Report
Talon Resources, Inc.
PO Box 1230
Huntington, UT 84528

Report ID: S[illegible]1001

Date: 11/14/2006
Work Order: S0610051

Project: Talon Resources Soil
Date Received: 10/3/2006

Lab ID	Sample ID	Depths In.	CO3 %	Alkalinity PE meq/L
S0610051-064	WRD-20	6-13	20.8	3.13
S0610051-065	WRD-20	13-28	25.4	2.30
S0610051-066	WRD-20	28-54	21.7	2.72
S0610051-067	WRD-20	54-72	24.3	2.51
S0610051-079	WRD-20	72-96	16.5	2.51
S0610051-068	WRD-22	0-6	20.2	3.13
S0610051-069	WRD-22	6-15	23.8	2.72
S0610051-070	WRD-22	15-28	18.9	2.72
S0610051-071	WRD-22	28-48	17.9	2.30
S0610051-072	WRD-22	48-60	17.5	2.30
S0610051-073	WRD-22	60-84	21.0	2.51
S0610051-074	WRD-23	0-6	21.4	4.60
S0610051-075	WRD-23	6-12	23.6	3.34
S0610051-076	WRD-23	12-22	25.6	3.24
S0610051-077	WRD-23	22-40	29.8	2.30
S0610051-078	WRD-23	40-62	35.3	1.99
S0610051-035	WRD-23	62-80	30.4	2.09

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potentia
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Barten
Karen Barten, Soil Lab Supervisor

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Div. of Oil, Gas & Mining

LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07040226

Report Date: 04/24/07
Date Received: 04/05/07

Sample ID	Client Sample ID	Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Ca SatPst	Mg SatPst	Na SatPst	SAR
		Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	meq/L	meq/L	meq/L	unitless
		Depth	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
C07040226-001	SP-28	0-8	0.47	60.2	18.9	7.7	3.9	7.56	0.32	1.0	< 5	2.8	2.3	1.0	0.65
C07040226-002	SP-28	8-24	0.48	65.4	17.6	8.0	1.6	4.44	0.17	0.77	< 5	1.8	2.4	2.2	1.50
C07040226-003	SP-28	24-48	5.94	72.6	18.5	8.1	2.8	13.6	0.48	0.77	< 5	13	42	29	5.50
C07040226-004	SP-35	0-9	0.56	55.4	16.7	7.7	5.1	27.7	1.3	1.8	45	4.0	2.7	0.20	0.11
C07040226-005	SP-35	9-19	0.44	54.6	17.4	7.9	1.1	27.0	1.3	1.6	25	2.4	2.3	0.19	0.12
C07040226-006	SP-35	19-30	0.40	31.5	15.0	8.2	1.1	20.1	1.6	1.1	5	1.5	1.8	0.28	0.22
C07040226-007	SP-35	30-45	0.37	30.5	17.7	8.4	1.1	24.1	2.0	0.70	< 5	0.98	1.4	0.23	0.22
C07040226-008	SP-35	45-70	0.46	37.3	18.0	8.8	1.0	45.9	3.1	1.3	< 5	0.73	1.4	0.37	0.37
C07040226-009	SP-37	0-6	0.51	46.7	4.5	7.8	3.9	8.71	0.46	0.83	10	5.1	2.1	0.16	0.08
C07040226-010	SP-37	6-12	0.44	45.4	7.5	7.7	6.5	7.15	0.40	0.71	< 5	4.2	1.8	0.16	0.09
C07040226-011	SP-37	12-24	0.29	38.7	11.1	8.0	1.9	3.94	0.26	0.35	< 5	2.3	1.4	0.18	0.13
C07040226-012	SP-37	24-38	0.25	35.2	15.3	8.2	2.0	1.24	0.09	0.096	< 5	1.6	1.7	0.18	0.14
C07040226-013	SP-37	38-58	0.27	30.3	17.3	8.2	1.5	1.22	0.10	0.069	< 5	1.5	2.0	0.44	0.34
C07040226-014	SP-38	0-6	0.47	69.9	24.7	8.0	2.7	14.2	0.52	0.74	8	3.2	3.4	0.17	0.09
C07040226-015	SP-38	6-12	0.33	81.8	17.8	8.3	1.6	5.55	0.17	0.42	< 5	1.5	3.4	0.23	0.15
C07040226-016	SP-38	12-20	0.49	71.1	28.3	8.5	1.4	2.58	0.09	0.23	< 5	1.3	5.2	0.70	0.39
C07040226-017	SP-38	20-24	0.57	71.5	44.5	8.3	3.0	3.04	0.11	0.21	< 5	1.8	5.6	0.84	0.44
C07040226-018	SP-39	0-6	0.32	43.7	8.5	7.8	2.1	2.87	0.17	0.45	6	3.1	1.2	0.27	0.19
C07040226-019	SP-39	6-12	0.38	41.9	7.9	7.8	1.7	3.07	0.19	0.45	< 5	3.9	1.5	0.34	0.21
C07040226-020	SP-39	12-24	0.23	35.3	13.9	8.0	1.2	1.46	0.11	0.17	< 5	2.2	0.98	0.30	0.24
C07040226-021	SP-39	24-36	0.20	32.3	14.4	7.9	1.2	1.10	0.09	0.089	< 5	1.7	1.0	0.20	0.17
C07040226-022	SP-40	0-6	0.53	85.8	14.4	8.0	1.5	19.0	0.57	1.1	11	2.3	4.6	0.86	0.47
C07040226-023	SP-40	6-12	1.81	88.4	18.0	8.4	1.1	13.2	0.38	0.50	6	3.1	20	3.8	1.01
C07040226-024	SP-40	12-22	1.29	76.1	19.9	9.0	1.1	5.83	0.20	0.26	6	0.51	14	4.1	1.46
C07040226-025	SP-41	0-6	0.46	51.3	14.5	8.0	1.4	29.1	1.5	1.1	8	3.9	1.7	0.20	0.12
C07040226-026	SP-41	6-12	0.53	54.9	12.1	8.0	4.7	22.4	1.0	1.5	6	4.4	2.7	0.27	0.15
C07040226-027	SP-41	12-36	0.22	69.0	16.6	8.1	1.1	5.32	0.20	0.69	< 5	1.4	1.6	0.19	0.15
C07040226-028	SP-41	36-64	0.43	63.9	18.5	8.2	1.1	6.72	0.27	0.41	< 5	1.4	3.9	0.65	0.40
C07040226-029	SP-41	64-80	0.66	31.5	17.3	8.8	1.2	3.50	0.28	0.15	< 5	0.67	5.7	2.9	1.63
C07040226-030	SP-42	0-9	0.33	42.8	18.0	7.9	3.9	6.62	0.39	0.42	5	3.7	0.97	0.16	0.10
C07040226-031	SP-42	9-24	0.28	60.9	18.5	8.1	3.5	8.00	0.34	0.81	< 5	2.5	1.3	0.26	0.19
C07040226-032	SP-42	24-36	0.32	44.7	16.0	8.3	1.5	6.81	0.39	0.36	< 5	2.3	2.9	0.31	0.20
C07040226-033	SP-42	36-48	0.28	31.4	18.2	8.6	1.4	5.31	0.43	0.43	< 5	0.94	1.8	1.3	1.14

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07040226

Report Date: 04/24/07
Date Received: 04/05/07

		Analysis	Organic Matter	Sand	Silt	Clay	Texture
		Units	%	%	%	%	
Sample ID	Client Sample ID	Depth	Results	Results	Results	Results	Results
C07040226-001	SP-28	0-8	2.5	7.0	38	55	C
C07040226-002	SP-28	8-24	1.4	9.0	34	57	C
C07040226-003	SP-28	24-48	1.0	4.0	36	60	C
C07040226-004	SP-35	0-9	4.3	12	44	44	SiC
C07040226-005	SP-35	9-19	1.8	16	40	44	SiC
C07040226-006	SP-35	19-30	1.2	51	27	22	SCL
C07040226-007	SP-35	30-45	0.75	59	27	14	SL
C07040226-008	SP-35	45-70	0.86	42	39	19	L
C07040226-009	SP-37	0-6	4.0	38	30	32	CL
C07040226-010	SP-37	6-12	2.9	48	23	29	SCL
C07040226-011	SP-37	12-24	3.0	56	24	20	SL - SCL
C07040226-012	SP-37	24-38	0.67	71	18	11	SL
C07040226-013	SP-37	38-58	0.45	73	18	9.0	SL
C07040226-014	SP-38	0-6	6.2	12	44	44	SiC
C07040226-015	SP-38	6-12	3.4	2.0	47	51	SiC
C07040226-016	SP-38	12-20	1.9	11	46	43	SiC
C07040226-017	SP-38	20-24	1.1	10	42	48	SiC
C07040226-018	SP-39	0-6	2.3	36	33	31	CL
C07040226-019	SP-39	6-12	2.4	38	30	32	CL
C07040226-020	SP-39	12-24	1.2	62	20	18	SL
C07040226-021	SP-39	24-36	0.50	75	15	10	SL
C07040226-022	SP-40	0-6	5.7	10	42	48	SiC
C07040226-023	SP-40	6-12	2.9	5.0	44	51	SiC
C07040226-024	SP-40	12-22	1.4	21	44	35	CL
C07040226-025	SP-41	0-6	3.3	46	26	28	SCL
C07040226-026	SP-41	6-12	3.4	25	34	41	C
C07040226-027	SP-41	12-36	1.7	6.0	44	50	SiC
C07040226-028	SP-41	36-64	0.96	12	52	36	SiCL
C07040226-029	SP-41	64-80	0.56	54	31	15	SL
C07040226-030	SP-42	0-9	2.4	50	30	20	L
C07040226-031	SP-42	9-24	2.8	8.0	49	43	SiC
C07040226-032	SP-42	24-36	1.7	52	27	21	SCL
C07040226-033	SP-42	36-48	0.92	44	34	22	L

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LABORATORY ANALYTICAL REPORT

Revised Date: 05/17/07
Report Date: 05/13/07
Date Received: 04/24/07

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07041141

		Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Se SatPst	Ca SatPst	Mg SatPst	Na SatPst
		Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	mg/L	meq/L	meq/L	meq/L
Sample ID	Client Sample ID	Depth	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
C07041141-001	Alton 48	0-3	0.52	85.6	4.5	7.7	2.6	6.41	0.19	1.1	10	< 0.001	3.6	1.3	1.4
C07041141-002	Alton 48	3-12	0.57	95.4	7.2	8.0	1.1	2.39	0.06	0.79	8	< 0.001	1.2	0.55	4.4
C07041141-003	Alton 48	12-30	2.63	106	7.5	8.2	1.3	5.38	0.13	0.86	7	< 0.001	3.0	1.8	17
C07041141-004	Alton 48	30-48	4.65	81.0	5.2	8.1	< 1.0	7.36	0.23	0.94	7	< 0.001	6.5	4.1	29
C07041141-005	Alton 48	48-84	6.20	87.5	4.0	7.9	1.4	11.8	0.35	1.1	9	< 0.001	15	8.1	37

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LABORATORY ANALYTICAL REPORT

Revised Date: 05/17/07
Report Date: 05/13/07
Date Received: 04/24/07

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow
Workorder: C07041141

		Analysis	SAR	Very Fine Sand	Sand	Silt	Clay	Texture	Organic Matter
		Units	unitless	%	%	%	%		%
Sample ID	Client Sample ID	Depth	Results	Results	Results	Results	Results	Results	Results
C07041141-001	Alton 48	0-3	0.92	4.8	7.0	33	60	C	3.5
C07041141-002	Alton 48	3-12	4.68	5.3	6.0	30	64	C	1.9
C07041141-003	Alton 48	12-30	11.2	11	12	28	60	C	1.7
C07041141-004	Alton 48	30-48	12.7	9.5	10	28	62	C	1.6
C07041141-005	Alton 48	48-84	10.8	6.5	7.0	30	63	C	1.5

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow Project
Workorder: C07040695

Report Date: 05/06/07
Date Received: 04/16/07

		Analysis	EC SatPst	Saturation SatPst	Lime as CaCO3	pH SatPst	NO3 Soluble	K Soluble	K SatPst	K NH4OAc	P, Olsen-NAHCO3	Ca SatPst	Mg SatPst	Na SatPst	SAR
		Units	mmhos/cm	%	%	s_u_	mg/kg-dry	mg/kg-dry	meq/L	meq/100g	mg/kg-dry	meq/L	meq/L	meq/L	unitless
Sample ID	**Client Sample ID**	**Depth**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
C07040695-001	Alton 49	0-3	0.42	58.0	17.8	8.1	< 1.0	7.04	0.31	0.46	7	2.9	1.5	0.07	0.05
C07040695-002	Alton 49	3-10	0.34	55.5	17.7	8.4	< 1.0	7.32	0.34	0.39	8	2.0	1.5	0.08	0.06
C07040695-003	Alton 50	0-4	0.20	75.4	18.5	8.4	1.4	6.38	0.22	0.78	6	1.6	0.36	0.13	0.13
C07040695-004	Alton 50	4-11	0.27	66.2	18.7	8.1	1.4	6.08	0.24	0.81	8	1.9	0.53	0.32	0.29
C07040695-005	Alton 50	11-19	0.30	72.0	18.5	8.4	1.3	4.97	0.18	0.65	9	1.9	0.59	0.57	0.52

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development / Talon Resources
Project: Coal Hollow Project
Workorder: C07040695

Report Date: 05/06/07
Date Received: 04/16/07

		Analysis	Sand	Silt	Clay	Texture	Organic Matter
		Units	%	%	%		%
Sample ID	**Client Sample ID**	**Depth**	**Results**	**Results**	**Results**	**Results**	**Results**
C07040695-001	Alton 49	0-3	20	49	31	SiCL	2.0
C07040695-002	Alton 49	3-10	26	47	27	CL - L	2.3
C07040695-003	Alton 50	0-4	5.0	37	58	C	1.4
C07040695-004	Alton 50	4-11	< 1.0	39	61	C	1.3
C07040695-005	Alton 50	11-19	6.0	39	55	C	1.4

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Table C-2. Summary of laboratory analysis of overburden samples for Coal Hollow cor holes, year 1.

Sample ID	pH (Sat Paste)	E.C. @25°C	SAR	Sand	Silt	Clay	USDA Texture Class[1]	Very Fine Sand	Saturation Percent	Available Water Capacity[2]	Organic Matter (calculated)[3]	Organic Carbon	Erodibility Factor (K-Factor)[4]	$CaCO_3$	Boron (soluble)	Se (Hot H_2O sol)	Calcium, soluble (Sat. Paste)	Magnesium, soluble (Sat. Paste)	Sodium, soluble (Sat. Paste)	Potassium, soluble (Sat. Paste)	Nitrogen-Nitrate	Phosphorus	Alkalinity
	units	dS/m	unitless	%	%	%		%	%	in/in	%	%	unitless	%	mg/Kg	mg/Kg	meq/L	meq/L	meq/L	meq/L	mg/Kg	mg/Kg	meq/L
CH-01-05, 3 ft	8.00	0.33	0.12	0	49	51	SiC	0	78.4	0.12	2.0	1.05	0.29	28.3	0.4	†	1.42	1.63	0.14	0.37	<1	†	†
CH-01-05, 6 ft	8.20	0.34	0.33	0	49	51	SiC	0	82.9	0.12	1.5	0.77	0.30	30	0.4	†	0.69	2.19	0.4	0.35	<1	†	†
CH-01-05, 9-10 ft	8.40	0.52	0.96	10	61	29	SiCL	3	52.2	0.18	0.8	0.4	0.46	35.3	0.3	†	0.57	3.4	1.36	0.28	<1	†	†
CH-01-05, 12 ft	8.20	0.78	0.8	0	53	47	SiC	0	84.6	0.14	0.9	0.48	0.34	30.3	0.2	†	1.48	5.36	1.49	0.31	<1	†	†
CH-01-05, 12-13 ft	8.30	0.73	0.7	44	39	17	L	11	35.9	0.13	0.6	0.3	0.38	25.5	<0.1	†	1.71	4.69	1.25	0.26	<1	†	†
CH-01-05, 16 ft	8.30	0.65	0.66	20	55	25	SiL	6	50.5	0.17	0.7	0.35	0.42	30.3	0.1	†	1.58	4.05	1.11	0.27	<1	†	†
CH-01-05, 30 ft	8.00	3.13	0.79	8	47	45	SiC	0	81.9	0.14	0.9	0.45	0.32	26.1	0.4	†	16.9	25.8	3.65	1.11	1	†	†
CH-03-05, 0-3 ft	7.80	0.42	0.05	70	21	9	SL	11	25.7	0.08	1.2	0.62	0.24	15.6	<0.1	†	2.98	1.26	0.07	0.3	2	†	†
CH-03-05, 3-6 ft	8.30	0.27	0.09	77	17	6	LS	9	21.8	0.07	0.4	0.23	0.22	27.7	<0.1	†	1.73	0.87	0.1	0.12	<1	†	†
CH-03-05, 9 ft	8.40	0.25	0.11	82	13	5	LS	7	20.4	0.06	0.3	0.15	0.17	46.2	<0.1	†	1.1	1.32	0.13	0.09	<1	†	†
CH-03-05, 16 ft	8.40	0.4	0.31	80	14	6	LS	5	20.2	0.06	0.2	0.11	0.17	64.7	<0.1	†	1.22	2.24	0.4	0.16	<1	†	†
CH-05-05, 0-1 ft	7.90	0.43	0.1	30	41	29	CL	3	44.5	0.15	1.7	0.91	0.30	22.7	0.2	†	2.22	2.21	0.15	0.19	3	†	†
CH-05-05, 3 ft	8.20	0.43	0.19	64	23	13	SL	12	27	0.09	0.7	0.39	0.26	24.9	<0.1	†	1.28	3.02	0.28	0.15	1	†	†
CH-05-05, 9-10 ft	8.40	0.43	0.26	78	17	5	LS	4	20.8	0.06	0.2	0.13	0.18	60	<0.1	†	1.05	3.01	0.36	0.15	<1	†	†
CH-05-05, 14 ft	8.30	0.54	1.04	0	39	61	C	0	97.3	0.26	1.0	0.5	0.24	19.1	0.2	†	1.5	2.69	1.51	0.21	<1	†	†
CH-05-05, 19 ft	8.10	1.04	3.57	2	37	61	C	0	97.6	0.25	0.8	0.44	0.23	18.2	0.4	†	2.67	2.71	5.85	0.27	<1	†	†
Maximum	8.40	3.13	3.57	82.00	61.00	61.00		12	97.60	0.26	2.0	1.05	0.46	64.70	0.40		16.90	25.80	5.85	1.11			
Minimum	7.80	0.25	0.05	0.00	13.00	5.00		0	20.20	0.06	0.2	0.11	0.17	15.60	0.10		0.57	0.87	0.07	0.09			
Average	8.20	0.67	0.63	35.31	35.94	28.75	CL	4	52.61	0.13	0.9	0.46	0.28	31.56	0.29		2.51	4.15	1.14	0.29			

1. USDA soil textures: sand (S); loamy sand (LS); sandy loam (SL); loam (L); clay loam (CL); sandy clay loam (SCL); silty clay loam (SiCL); silty clay (SiC); clay (C).
2. Available water capacity calculated using using *Soil Water Characteristics Model* (Saxton et al., 1986).
3. Organic matter calculated from percent organic carbon.
4.Erodibility factor (K) calculated from lab and field data

Suitability Rating (Table 4. Utah DOGM, 2005): Good | Fair | Poor | Unacceptable

Undable to calculate because referenced calcualtion in Table 7, Footnote # 3 above is invalid for soils with percent silt + fine sand greater than 70 percent.

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

	Analysis	Sand	Silt	Clay	Very Fine Sand	Texture	pH, Sat Paste	Cond_ Paste	Saturation	Ca, Sat Paste	Mg, Sat Paste	K, Sat Paste	Na, Sat Paste	SAR
	Units	%	%	%	wt%		s_u_	mmhos/cm	%	meq/L	meq/L	meq/L	meq/L	unitless
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07041015-001	CH-01-05, 3 Feet	< 1	49	51	0	SiC	8.00	0.33	78.4	1.42	1.63	0.37	0.14	0.12
B07041015-002	CH-01-05, 6 Feet	< 1	49	51	0	SiC	8.20	0.34	82.9	0.69	2.19	0.35	0.40	0.33
B07041015-003	CH-01-05, 9-10 Feet	10	61	29	3	SiCL	8.40	0.52	52.2	0.57	3.40	0.28	1.36	0.96
B07041015-004	CH-01-5, 12 Feet	< 1	53	47	0	SiC	8.20	0.78	84.6	1.48	5.36	0.31	1.49	0.80
B07041015-005	CH-01-05, 12-13 Feet	44	39	17	11	L	8.30	0.73	35.9	1.71	4.69	0.26	1.25	0.70
B07041015-006	CH-01-05, 16 Feet	20	55	25	6	SiL	8.30	0.65	50.5	1.58	4.05	0.27	1.11	0.66
B07041015-007	CH-01-05, 30 Feet	8	47	45	0	SiC	8.00	3.13	81.9	16.9	25.8	1.11	3.65	0.79
B07041015-008	CH-03-05, 0-3 Feet	70	21	9	11	SL	7.80	0.42	25.7	2.98	1.26	0.30	0.07	0.05
B07041015-009	CH-03-05, 3-6 Feet	77	17	6	9	LS	8.30	0.27	21.8	1.73	0.87	0.12	0.10	0.09
B07041015-010	CH-03-05, 9 Feet	82	13	5	7	LS	8.40	0.25	20.4	1.10	1.32	0.09	0.13	0.11
B07041015-011	CH-03-05, 16 Feet	80	14	6	5	LS	8.40	0.40	20.2	1.22	2.24	0.16	0.40	0.31
B07041015-012	CH-05-05, 0-1 Feet	30	41	29	3	CL	7.90	0.43	44.5	2.22	2.21	0.19	0.15	0.10
B07041015-013	CH-05-05, 3 Feet	64	23	13	12	SL	8.20	0.43	27.0	1.28	3.02	0.15	0.28	0.19
B07041015-014	CH-05-05, 9-10 Feet	78	17	5	4	LS	8.40	0.43	20.8	1.05	3.01	0.15	0.36	0.26
B07041015-015	CH-05-05, 14 Feet	< 1	39	61	0	C	8.30	0.54	97.3	1.50	2.69	0.21	1.51	1.04
B07041015-016	CH-05-05, 19 Feet	2	37	61	0	C	8.10	1.04	97.6	2.67	2.71	0.27	5.85	3.57
B07041015-017	CH-06-05, Soil	2	45	53	0	SiC	8.00	0.54	79.5	1.33	1.51	0.08	3.17	2.66
B07041015-018	CH-06-05, 5-10 Feet	20	39	41	6	C	8.50	ISS	ISS	ISS	ISS	ISS	ISS	ISS
B07041015-019	CH-06-05, 10 Feet	12	41	47	9	SiC	8.20	7.95	90.9	22.7	52.2	0.93	60.8	9.93
B07041015-020	CH-06-05, 20 Feet	10	31	59	6	C	8.00	7.18	143	26.7	23.3	1.07	61.7	12.3
B07041015-021	CH-06-05, 35-40 Feet	7	26	67	4	C	8.20	6.33	275	19.5	9.3	0.88	60.0	15.8
B07041015-022	CH-06-05, 42-49 Feet	6	44	50	5	SiC	8.30	6.47	192	12.3	7.0	1.07	66.4	21.4
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	1	34	65	0	C	8.60	2.78	234	1.73	1.03	0.43	26.0	22.2

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

	Analysis	Neut Potential	Acid Potential	Acid/Base Potential	Lime	Organic Carbon	Nitrate as N	B-H2O Extr	As-Total	Ba-Total	Cd-Total	Cr-Total	Cu-Total	Fe-Total
	Units	t/kt	t/kt	t/kt	%	wt%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07041015-001	CH-01-05, 3 Feet	280	1.1	280	28.3	1.05	< 1	0.4	9	99	< 1	24	17	17300
B07041015-002	CH-01-05, 6 Feet	300	0	300	30.0	0.77	< 1	0.4	6	91	< 1	20	16	16100
B07041015-003	CH-01-05, 9-10 Feet	350	0	350	35.3	0.40	< 1	0.3	6	104	< 1	16	11	12800
B07041015-004	CH-01-5, 12 Feet	300	0	300	30.3	0.48	< 1	0.2	< 5	87	< 1	18	14	14400
B07041015-005	CH-01-05, 12-13 Feet	260	0	250	25.5	0.30	< 1	< 0.1	< 5	124	< 1	11	8	9780
B07041015-006	CH-01-05, 16 Feet	300	0	300	30.3	0.35	< 1	0.1	5	89	< 1	13	10	11300
B07041015-007	CH-01-05, 30 Feet	260	0	260	26.1	0.45	1	0.4	6	99	< 1	19	14	14100
B07041015-008	CH-03-05, 0-3 Feet	160	0	160	15.6	0.62	2	< 0.1	< 5	56	< 1	7	6	8620
B07041015-009	CH-03-05, 3-6 Feet	280	0	280	27.7	0.23	< 1	< 0.1	< 5	96	< 1	7	< 5	7000
B07041015-010	CH-03-05, 9 Feet	460	0	460	46.2	0.15	< 1	< 0.1	8	202	< 1	8	< 5	8100
B07041015-011	CH-03-05, 16 Feet	650	0	650	64.7	0.11	< 1	< 0.1	< 5	234	< 1	7	< 5	11400
B07041015-012	CH-05-05, 0-1 Feet	230	0	230	22.7	0.91	3	0.2	7	67	< 1	17	13	13500
B07041015-013	CH-05-05, 3 Feet	250	0	250	24.9	0.39	1	< 0.1	< 5	61	< 1	8	6	8120
B07041015-014	CH-05-05, 9-10 Feet	600	0	600	60.0	0.13	< 1	< 0.1	< 5	107	< 1	7	< 5	8140
B07041015-015	CH-05-05, 14 Feet	190	0	190	19.1	0.50	< 1	0.2	< 5	106	< 1	14	13	14500
B07041015-016	CH-05-05, 19 Feet	180	0	180	18.2	0.44	< 1	0.4	< 5	85	< 1	15	14	14600
B07041015-017	CH-06-05, Soil	21	0	20	2.1	0.73	6	0.2	< 5	65	< 1	18	14	13800
B07041015-018	CH-06-05, 5-10 Feet	130	0	130	12.6	0.37	1	0.6	< 5	63	< 1	12	11	10000
B07041015-019	CH-06-05, 10 Feet	69	0	68	6.9	0.35	3	0.4	< 5	57	< 1	15	13	14200
B07041015-020	CH-06-05, 20 Feet	60	1.6	58	6.0	0.38	8	0.4	< 5	94	< 1	25	19	16600
B07041015-021	CH-06-05, 35-40 Feet	90	3.6	87	9.0	0.33	5	2.3	< 5	124	< 1	11	11	11500
B07041015-022	CH-06-05, 42-49 Feet	51	17	34	5.1	0.90	17	2.7	< 5	84	< 1	15	10	13500
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	41	12	29	4.1	0.77	1	4.1	< 5	134	< 1	15	10	10600

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project:
Workorder: B07041015

Report Date: 04/27/07
Date Received: 04/12/07

	Analysis	Pb-Total	Mn-Total	Hg-Total	Mo-Total	Se-Total	Ag-Total	Zn-Total
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07041015-001	CH-01-05, 3 Feet	13	272	< 1	< 5	< 5	< 5	63
B07041015-002	CH-01-05, 6 Feet	12	222	< 1	< 5	< 5	< 5	61
B07041015-003	CH-01-05, 9-10 Feet	11	225	< 1	< 5	< 5	< 5	43
B07041015-004	CH-01-5, 12 Feet	11	283	< 1	< 5	< 5	< 5	54
B07041015-005	CH-01-05, 12-13 Feet	9	191	< 1	< 5	< 5	< 5	33
B07041015-006	CH-01-05, 16 Feet	10	159	< 1	< 5	< 5	< 5	40
B07041015-007	CH-01-05, 30 Feet	11	202	< 1	< 5	< 5	< 5	49
B07041015-008	CH-03-05, 0-3 Feet	7	152	< 1	< 5	< 5	< 5	28
B07041015-009	CH-03-05, 3-6 Feet	5	141	< 1	< 5	< 5	< 5	19
B07041015-010	CH-03-05, 9 Feet	< 5	217	< 1	< 5	< 5	< 5	14
B07041015-011	CH-03-05, 16 Feet	< 5	276	< 1	< 5	< 5	< 5	23
B07041015-012	CH-05-05, 0-1 Feet	11	264	< 1	< 5	< 5	< 5	47
B07041015-013	CH-05-05, 3 Feet	7	152	< 1	< 5	< 5	< 5	25
B07041015-014	CH-05-05, 9-10 Feet	< 5	233	< 1	< 5	< 5	< 5	16
B07041015-015	CH-05-05, 14 Feet	11	87	< 1	< 5	< 5	< 5	50
B07041015-016	CH-05-05, 19 Feet	11	144	< 1	< 5	< 5	< 5	54
B07041015-017	CH-06-05, Soil	11	118	< 1	< 5	< 5	< 5	46
B07041015-018	CH-06-05, 5-10 Feet	10	114	< 1	< 5	< 5	< 5	35
B07041015-019	CH-06-05, 10 Feet	9	108	< 1	< 5	< 5	< 5	35
B07041015-020	CH-06-05, 20 Feet	11	121	< 1	< 5	< 5	< 5	45
B07041015-021	CH-06-05, 35-40 Feet	19	322	< 1	< 5	< 5	< 5	44
B07041015-022	CH-06-05, 42-49 Feet	12	148	< 1	< 5	< 5	< 5	39
B07041015-023	CH-01-05, 50 Feet, Dark Grey Clay	13	80	< 1	< 5	< 5	< 5	43

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development, LLC
Project: Coal Hollow Project
Workorder: B07120398

Report Date: 12/18/07
Date Received: 12/06/07

	Analysis	Sand	Silt	Clay	Very Fine Sand	Texture	pH, Sat Paste	Cond_ Paste	Saturation	Ca, Sat Paste	Mg, Sat Paste	K, Sat Paste	Na, Sat Paste	SAR
	Units	%	%	%	wt%		s_u_	mmhos/cm	%	meq/L	meq/L	meq/L	meq/L	unitless
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120398-001	CH-08 70-79 ft	8	59	33	2	SiCL	8.60	2.68	94.8	0.50	0.27	0.23	26.1	42.1
B07120398-002	CH-08 79.2 - 82.3 ft	35	41	24	18	L	8.30	1.90	55.1	0.20	0.15	0.16	20.8	49.8
B07120398-003	CH-08 82.3 - 83.8 ft	50	31	19	19	L	7.50	6.48	37.9	9.4	4.2	0.90	63.6	24.5
B07120398-004	CH-08 101 - 103 ft underburden	16	42	42	7	SiC	8.40	6.72	110	2.5	2.1	0.54	72.8	48.1
B07120398-005	CH-07 0 - 6 ft	2	45	53	0	SiC	8.30	4.27	88.3	4.91	10.9	0.34	36.5	13.0
B07120398-006	CH-07 6 - 15 ft	10	41	49	3	SiC	8.50	9.33	101	23.2	33.0	0.71	84.2	15.9
B07120398-007	CH-07 15 - 19 ft	5	45	50	4	SiC	8.20	10.0	89.4	22.8	18.4	1.34	106	23.3
B07120398-008	CH-07 19 - 27 ft	< 1	43	57	0	SiC	8.20	8.71	134	20.5	11.1	1.01	90.5	22.8
B07120398-009	CH-07 27 - 36 ft	< 1	39	61	0	C	8.70	3.68	259	1.69	0.83	0.33	35.6	31.7
B07120398-010	CH-07 36 - 46 ft	< 1	45	55	0	SiC	9.40	0.90	240	< 0.05	< 0.08	0.06	9.16	52.2
B07120398-011	CH-08 0 - 6 ft	18	41	41	0	SiC	8.20	3.95	55.8	11.5	48.5	0.60	3.22	0.59
B07120398-012	CH-08 6 - 11 ft	60	25	15	10	SL	8.30	2.96	27.4	8.65	30.1	0.40	3.75	0.85
B07120398-013	CH-08 11 - 20 ft	42	37	21	6	L	8.00	3.84	33.2	24.3	24.0	0.65	7.21	1.47
B07120398-014	CH-08 20 - 30 ft	4	51	45	0	SiC	8.10	2.55	81.6	12.0	7.92	0.56	11.5	3.64
B07120398-015	CH-08 30 - 40 ft	26	45	29	9	CL	8.00	4.20	52.2	25.3	15.1	0.82	17.7	3.94
B07120398-016	CH-08 40 - 50 ft	18	48	34	8	SiCL	8.10	5.44	65.1	21.4	11.3	0.95	43.4	10.7
B07120398-017	CH-08 50 - 60 ft	19	46	35	8	SiCL	8.20	5.63	71.2	16.9	10.6	1.00	49.4	13.3
B07120398-018	CH-08 60 - 70 ft	10	45	45	4	SiC	8.80	4.22	123	3.09	1.58	0.43	43.8	28.7

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development, LLC
Project: Coal Hollow Project
Workorder: B07120398

Report Date: 12/18/07
Date Received: 12/06/07

	Analysis	Neut Potential	Acid Potential	Acid/Base Potential	Lime	Organic Carbon	Nitrate as N	B-H2O Extr	Se-H2O Extr	As-Total	Ba-Total	Cd-Total	Cr-Total	Cu-Total
	Units	t/kt	t/kt	t/kt	%	wt%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120398-001	CH-08 70-79 ft	170	9.8	160	16.7	1.70	1	1.0	0.02	8	74	< 1	12	11
B07120398-002	CH-08 79.2 - 82.3 ft	45	20	25	4.5	7.72	< 1	1.7	< 0.01	6	105	< 1	7	8
B07120398-003	CH-08 82.3 - 83.8 ft	37	13	24	3.7	1.82	< 1	1.4	< 0.01	< 5	54	< 1	5	< 5
B07120398-004	CH-08 101 - 103 ft underburden	110	14	93	10.7	4.60	1	6.5	0.02	< 5	79	< 1	13	13
B07120398-005	CH-07 0 - 6 ft	190	1.4	190	19.4	0.84	2	0.6	0.02	7	130	< 1	21	15
B07120398-006	CH-07 6 - 15 ft	220	1.1	220	21.8	0.33	1	0.8	0.03	< 5	91	< 1	15	12
B07120398-007	CH-07 15 - 19 ft	170	0	170	17.0	0.39	1	0.5	0.02	6	53	< 1	10	9
B07120398-008	CH-07 19 - 27 ft	110	3.2	100	10.7	0.66	1	0.8	0.01	7	56	< 1	11	9
B07120398-009	CH-07 27 - 36 ft	110	8.0	100	11.0	1.26	1	3.7	0.02	8	52	< 1	8	8
B07120398-010	CH-07 36 - 46 ft	95	8.3	87	9.5	1.09	1	3.2	0.01	< 5	49	< 1	< 5	10
B07120398-011	CH-08 0 - 6 ft	330	0	330	32.8	1.21	2	0.4	< 0.01	8	128	< 1	21	13
B07120398-012	CH-08 6 - 11 ft	290	0	290	29.2	0.28	2	0.1	< 0.01	5	124	< 1	9	6
B07120398-013	CH-08 11 - 20 ft	350	0	350	34.6	0.29	1	0.1	< 0.01	< 5	114	< 1	10	8
B07120398-014	CH-08 20 - 30 ft	120	0	120	11.6	0.44	1	0.3	0.01	< 5	59	< 1	12	12
B07120398-015	CH-08 30 - 40 ft	220	0	220	22.3	0.32	1	0.3	< 0.01	< 5	82	< 1	10	9
B07120398-016	CH-08 40 - 50 ft	210	3.8	210	21.2	0.65	1	0.6	< 0.01	5	94	< 1	13	11
B07120398-017	CH-08 50 - 60 ft	210	5.2	200	20.9	0.54	1	0.7	< 0.01	< 5	94	< 1	13	11
B07120398-018	CH-08 60 - 70 ft	150	11	140	15.2	0.70	1	0.8	0.02	< 5	91	< 1	16	14

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal Development, LLC
Project: Coal Hollow Project
Workorder: B07120398

Report Date: 12/18/07
Date Received: 12/06/07

	Analysis	Fe-Total	Pb-Total	Mn-Total	Hg-Total	Mo-Total	Se-Total	Ag-Total	Zn-Total
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120398-001	CH-08 70-79 ft	13700	11	162	< 1	< 5	< 5	< 5	39
B07120398-002	CH-08 79.2 - 82.3 ft	6860	7	48	< 1	< 5	< 5	< 5	25
B07120398-003	CH-08 82.3 - 83.8 ft	6810	< 5	35	< 1	< 5	< 5	< 5	13
B07120398-004	CH-08 101 - 103 ft underburden	10900	13	127	< 1	< 5	< 5	< 5	46
B07120398-005	CH-07 0 - 6 ft	16400	14	255	< 1	< 5	< 5	< 5	54
B07120398-006	CH-07 6 - 15 ft	11800	11	179	< 1	< 5	< 5	< 5	36
B07120398-007	CH-07 15 - 19 ft	9500	9	109	< 1	< 5	< 5	< 5	26
B07120398-008	CH-07 19 - 27 ft	11300	13	93	< 1	< 5	< 5	< 5	35
B07120398-009	CH-07 27 - 36 ft	9440	13	81	< 1	< 5	< 5	< 5	33
B07120398-010	CH-07 36 - 46 ft	6820	21	86	< 1	10	< 5	< 5	41
B07120398-011	CH-08 0 - 6 ft	13600	11	293	< 1	< 5	< 5	< 5	47
B07120398-012	CH-08 6 - 11 ft	8270	6	184	< 1	< 5	< 5	< 5	24
B07120398-013	CH-08 11 - 20 ft	9330	5	194	< 1	< 5	< 5	< 5	26
B07120398-014	CH-08 20 - 30 ft	9650	11	88	< 1	< 5	< 5	< 5	38
B07120398-015	CH-08 30 - 40 ft	10000	8	166	< 1	< 5	< 5	< 5	31
B07120398-016	CH-08 40 - 50 ft	12200	10	172	< 1	< 5	< 5	< 5	36
B07120398-017	CH-08 50 - 60 ft	11000	9	165	< 1	< 5	< 5	< 5	32
B07120398-018	CH-08 60 - 70 ft	12900	12	148	< 1	< 5	< 5	< 5	45

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project: Coal Hollow Project
Workorder: B07120524

Report Date: 12/18/07
Date Received: 12/07/07

	Analysis	Sand	Silt	Clay	Very Fine Sand	Texture	pH, Sat Paste	Cond_ Paste	Saturation	Ca, Sat Paste	Mg, Sat Paste	K, Sat Paste	Na, Sat Paste	SAR
	Units	%	%	%	wt%		s_u_	mmhos/cm	%	meq/L	meq/L	meq/L	meq/L	unitless
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120524-001	CH-01-05, Coal Grab Sample	92	5	3	5	S	5.70	3.04	75.0	24.8	15.5	0.22	4.42	0.99

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project: Coal Hollow Project
Workorder: B07120524

Report Date: 12/18/07
Date Received: 12/07/07

	Analysis	Neut Potential	Acid Potential	Acid/Base Potential	S, Total	S, H2O Extr	S, HCL Extr	S, HNO3 Extr	S, Residual	Lime	Organic Carbon	Nitrate as N	B-H2O Extr	Se-H2O Extr
	Units	t/kt	t/kt	t/kt	%	%	%	%	%	%	wt%	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120524-001	CH-01-05, Coal Grab Sample	25	81	-56	2.78	0.18	0.01	1.34	1.25	2.5	38.5	1	5.6	< 0.01

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LABORATORY ANALYTICAL REPORT

Client: Alton Coal
Project: Coal Hollow Project
Workorder: B07120524

Report Date: 12/18/07
Date Received: 12/07/07

	Analysis	As-Total	Ba-Total	Cd-Total	Cr-Total	Cu-Total	Fe-Total	Pb-Total	Mn-Total	Hg-Total	Mo-Total	Se-Total	Ag-Total	Zn-Total
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B07120524-001	CH-01-05, Coal Grab Sample	< 8	53	< 1	< 5	9	8830	< 5	47	< 1	< 5	< 8	< 5	17

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Profile 1. A Family: fine, mixed, superactive, mesic Aridic Calciustept, photo not available.

Profile 2. D Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 3. M Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 4. Calendar Family: fine, mixed, superactive, mesic Aridic Haplustepts.

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Profile 5. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 5 Area. Surrounding area.

Profile 6. Cibeque Family: fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 6 Area. Surrounding area.

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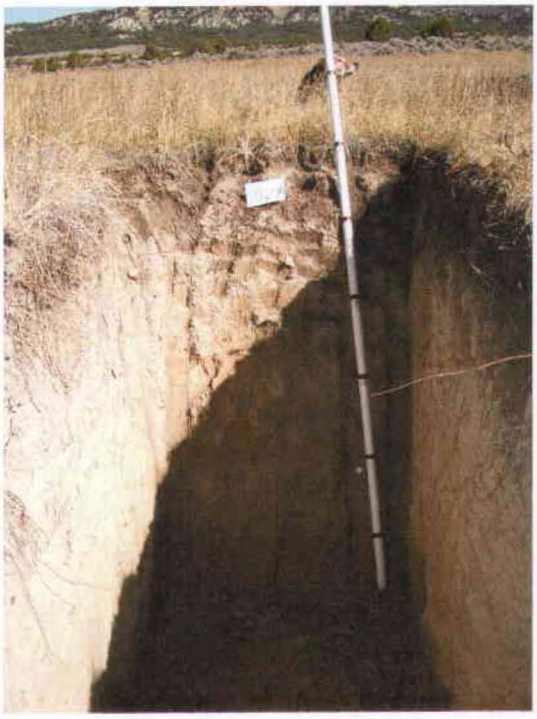
Profile 7. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.



Profile 9A. Graystone; coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 8. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 9B. Cookcan: coarse-loamy, mixed, superactive, frigid Typic Calciaquoll.

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Profile 10. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 12. M Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 11. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 13. Cibeque Family: fine-loamy, mixed, superactive, mesic Aridic Calciustept.

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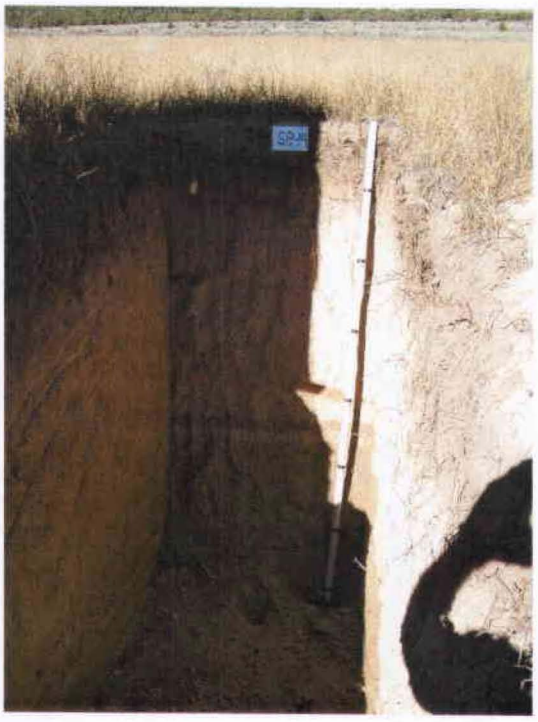

Profile 14. I Family: fine-loamy, mixed, superactive, frigid Aquic Calciustept.

Profile 16. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 15. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 17. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

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Profile 18A. Alamosa: fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 19. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 18B. Jonale Family: fine-loamy, mixed, superactive, frigid Aridic Calciustoll.

Profile 20. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

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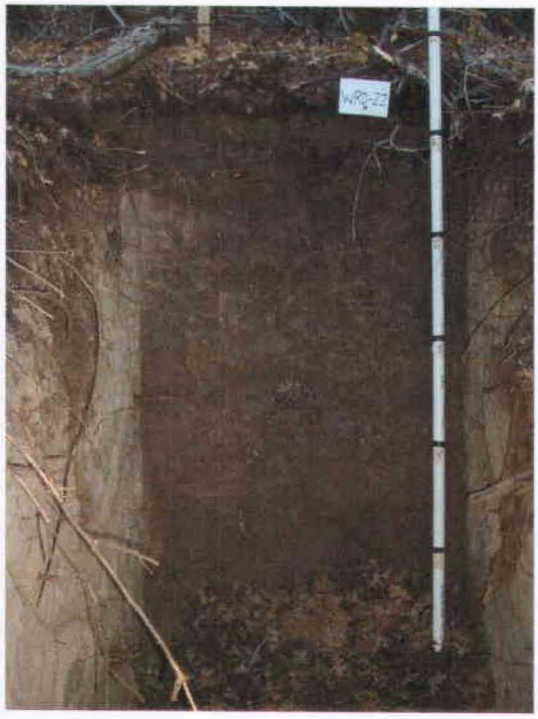
Profile 21. Snilloc: coarse-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 23. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 22 Brumley: fine-loamy, mixed, superactive, mesic Calcidic Haplustalf.

Profile 24. Calendar Family: fine, mixed, superactive, mesic Aridic Haplustepts.

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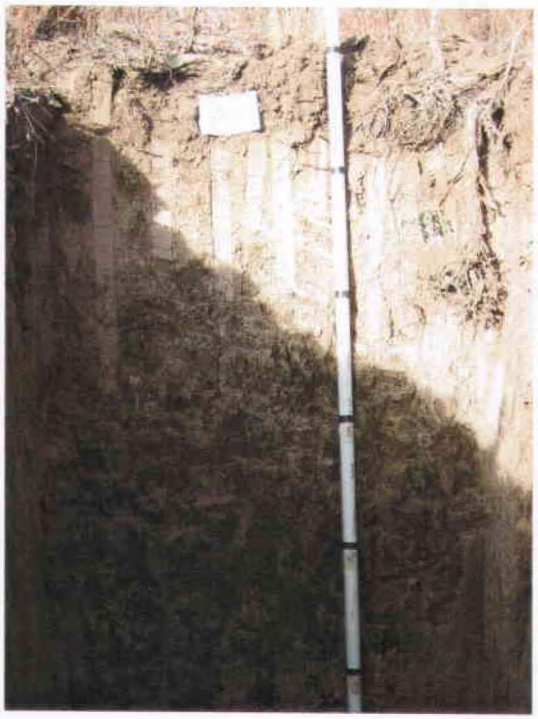
Profile 25. M family: fine, mixed, superactive, mesic Aridic Calciustept.



Profile 26. N Family: fine, mixed, superactive, frigid Aquic Calciustoll.

Profile 27 A Family: fine, mixed, superactive, mesic Aridic Calciustept, photo not available.

Profile 28. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 29. D Family: fine, mixed, superactive, mesic Aridic Calciustoll, photo not available.

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Profile 30. A Family; fine, mixed, superactive, mesic Aridic Calciustept.

Profile 31. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll, photo not available.

Profile 32 Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 33. D Family: fine, mixed, superactive, mesic Aridic Calciustoll, photo not available.

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Profile 34. Jonale Family; fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 35. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 34 Area. Surrounding area.

Profile 35 Area. Surrounding area.

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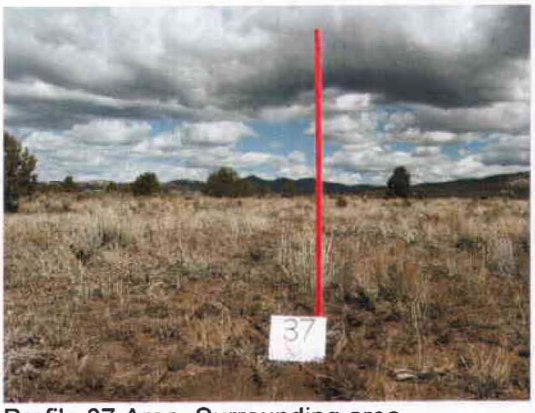
Profile 36. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 37. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 36 Area. Surrounding area.



Profile 37 Area. Surrounding area.

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Profiles 38. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 39. Graystone cobbly substratum family: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 38 Area. Surrounding area.

Profile 39 Area. Surrounding area.

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Profile 40. Tetonview Family: fine-loamy, mixed, superactive, frigid Aeric Calciaquoll.

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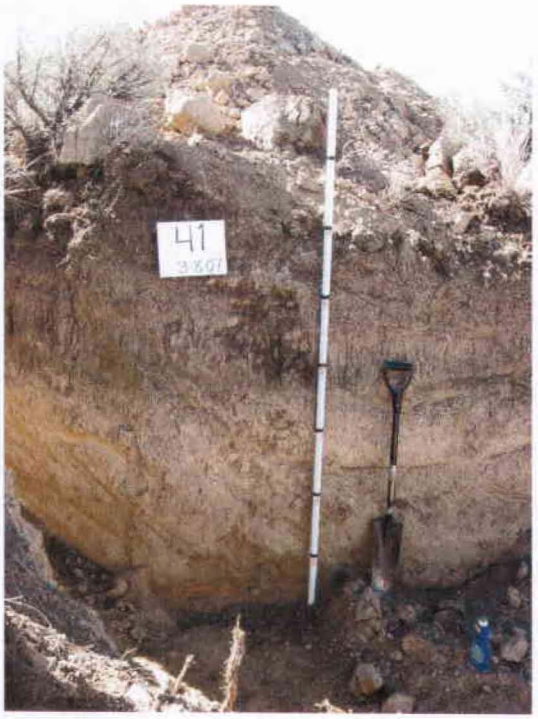

Profile 41. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 42. Deacon: fine-loamy, mixed, superactive, mesic Aridic Haplustoll.

Profile 41 Area. Surrounding area.

Profile 42 area. Surrounding area.

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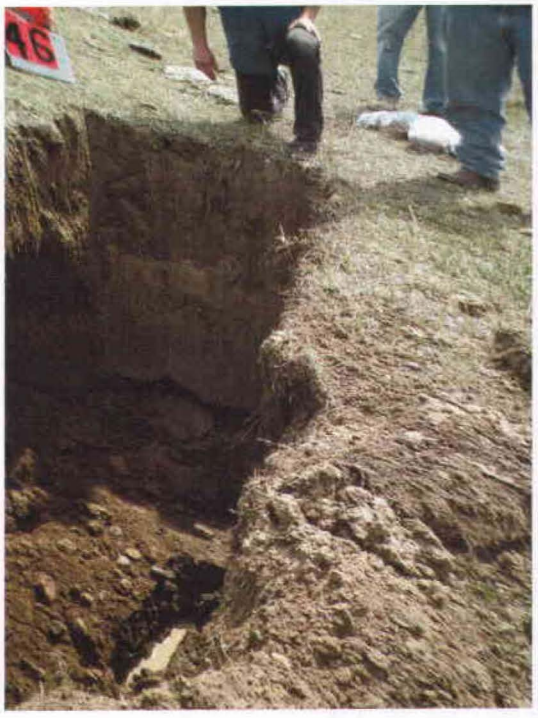
Profile 43. Jicarilla Family: fine, mixed, superactive, frigid Typic Argiaquoll, photo not available.

Profile 44. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 45. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.



Profile 46. Alamosa: fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

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Profile 47. Brumley: fine-loamy, mixed, superactive, mesic Calcidic Hapustalf.

Profile 50. Zigzag: clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent.

Profile 48. Manzanst Taxadjunct Family: fine, mixed, superactive, mesic Aridic Haplustalf.

Profile 51. Brumley: fine-loamy, mixed superactive, mesic Calcidic Haplustalf. No photo available.

Profile 49 Area. Drifity Family: loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent.

Photo 52. I Family: fine-loamy, mixed, superactive, frigid Aquic Calciustept.

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Photo 53. Disturbed soil with single head sunflower.

Photo 54. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.

Photo 55. Cibeque Family: fine-laomy, mixed, superactive, mesic Aridic Calciustept.

Photo 56. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Photo 57. Cibeque Family. fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Photo 58. Manzanst Taxadjunct Family: very fine, mixed, superactive, mesic Aridic Haplustalf.

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Photo 59. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Photo 60. Manzanst Taxadjunct Family: very fine, mixed, superactive, mesic Aridic Haplustalf.

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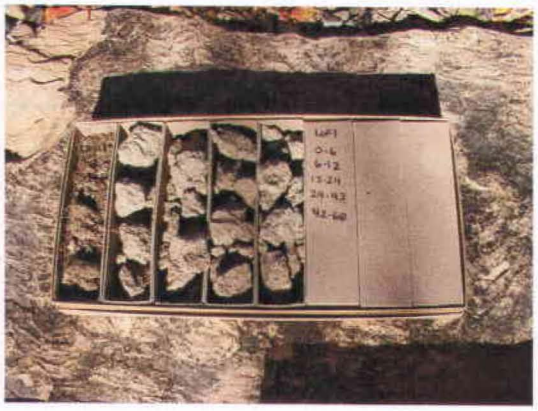
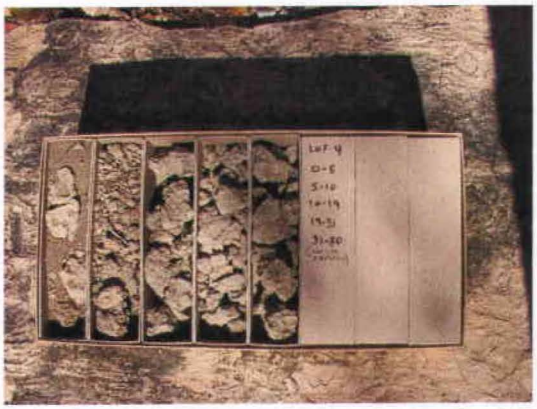


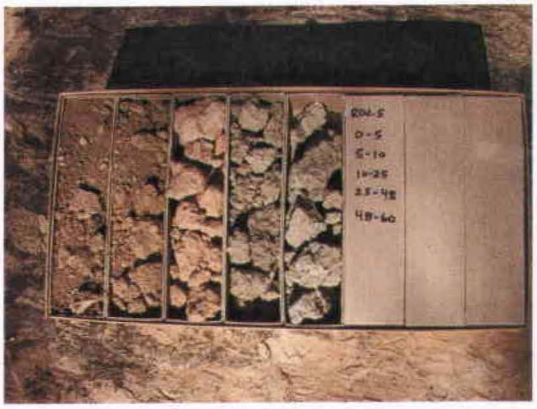
Profile 1. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 2. D Family: fine, mixed, superactive, mesic Aridic Calciustept.

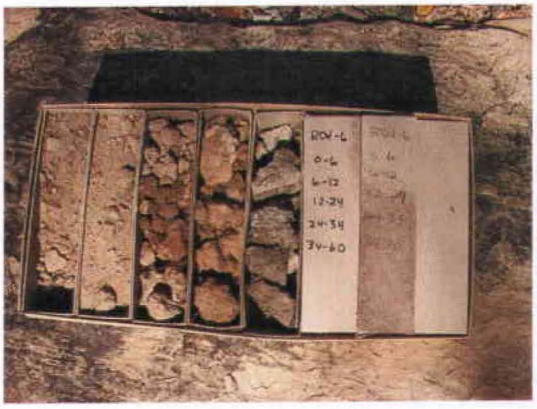
Profile 3. M Family; fine, mixed, superactive, mesic Aridic Calciustept.



Profile 4. Calendar Family: fine, mixed, superactive, mesic Aridic Haplustepts.



Profile 5. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 6. Cibeque Family: fine-loamy, mixed, superactive, mesic Aridic Calciustept.

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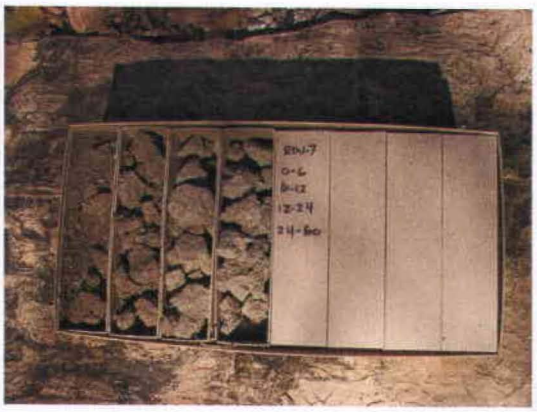
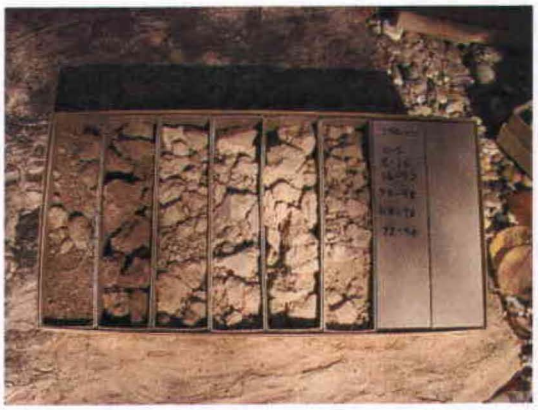


Profile 7. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 8. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

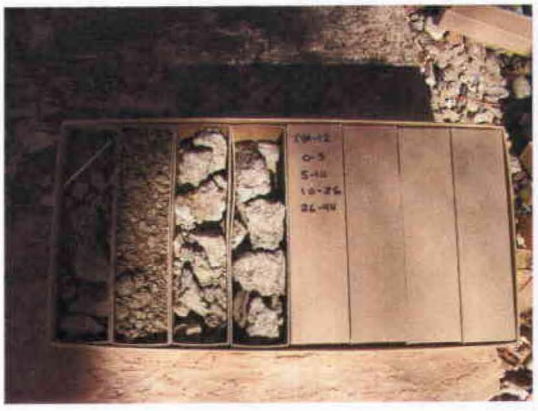
Profile 9A. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 9B. Photo not available: Cookcan: coarse-loamy, mixed, superactive, frigid Typic Calciaquoll.



Profile 10. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 11. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 12. M Family: fine, mixed, superactive, mesic Aridic Calciustept.

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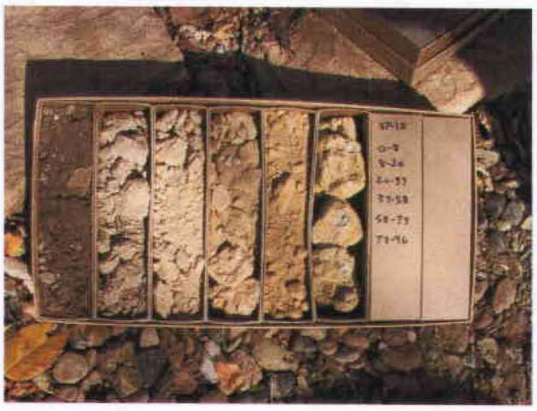
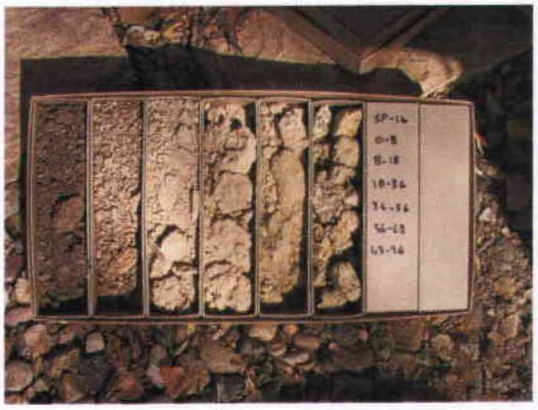
Profile 13. Cibeque Family: fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 14. I Family: fine-loamy, mixed, superactive, frigid Aquic Calciustept.

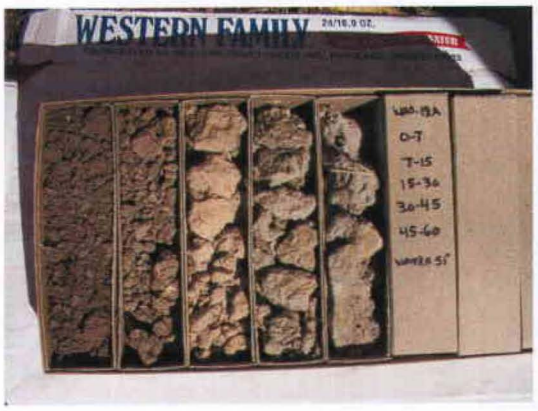


Profile 15. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 16. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 17. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 18A. Alamosa: fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

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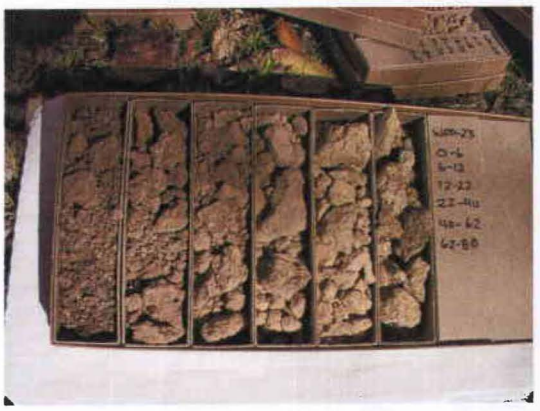
Profile 18B. Jonale Family: fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 21. Snilloc: coarse-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 19. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 22. Brumley: fine-loamy, mixed, superactive, mesic Calcidic Haplustalf.

Profile 20. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.



Profile 23. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

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Profile 24. Calendar Family: fine, mixed, superactive, mesic Aridic Haplustepts.

Profile 27. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 25. M Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 28. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 26. N Family: fine, mixed, superactive, frigid Aquic Calciustoll.

Profile 29. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.

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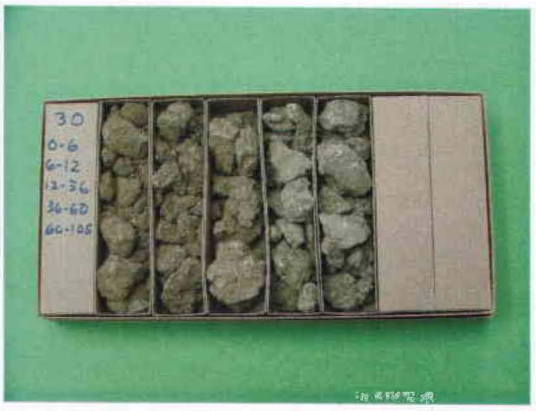

Profile 30. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 31. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 32. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 33. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 34. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 35. Jonale Family: fine-loamy, mixed, superactive, mesic Aridic Calciustoll.

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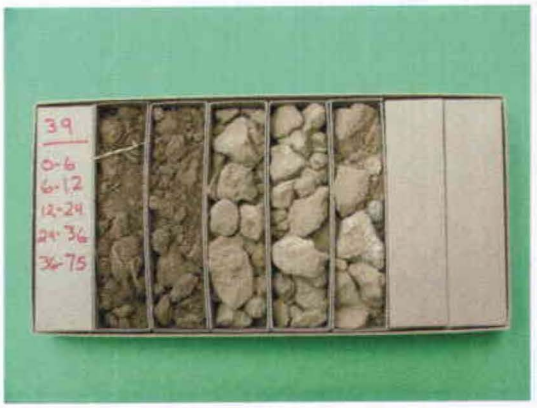
Profile 36. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 37. Graystone: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profiles 38 (Left) and 40 (Right). Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept; Tetonview Family: (40) fine-loamy, mixed, superactive, frigid Aeric Calciaquoll.



Profile 39. Graystone cobbly substratum Family: coarse-loamy, mixed, superactive, mesic Aridic Calciustoll.

Profile 41. D Family: fine, mixed, superactive, mesic Aridic Calciustoll.

Profile 42. Deacon: fine-loamy, mixed, superactive, mesic Aridic Haplustoll.

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Profile 43. Jicarilla Family: fine, mixed, superactive, frigid Typic Argiaquoll.

Profile 44. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 45. Happyhollow Family: fine, mixed, superactive, frigid Aeric Epiaquept.

Profile 46. Alamosa: fine-loamy, mixed, superactive, frigid Typic Argiaquoll.

Profile 47. Brumley: fine-loamy, mixed, superactive, mesic Calcidic Hapustalf.

Profile 48. Manzanst Taxadjunct Family: very fine, mixed, superactive, mesic Aridic Haplustalf.

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Profile 49 (Left) and 50 (Right). Drifity Family (49): loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent; and Zigzag (50): clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent.

Profile 51. Brumley: fine-loamy, mixed, superactive, mesic Calcidic Haplustalf.

Profile 52. I Family: fine-loamy, mixed, superactive, frigid Aquic Calciustept.

Profile 53. Disturbed soil with one-head sunflowers.

Profile 54. Happyhollow Family: fine mixed, superactive, frigid Aeric Epiaquept.

Profile 55. Cibeque Family: fne-loamy, mixed, superactive, mesic Aridic Calciustept.

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Profile 56. Wapiti Family: fine-loamy, mixed, superactive, mesic Calcidic Argiustoll.

Profile 57. Cibeque Family: fine-loamy, mixed, superactive, mesic Aridic Calciustept.

Profile 58. Manzanst Taxadjunct Family: very fine, mixed, superactive, mesic Aridic Haplustalf.

Profile 59. A Family: fine, mixed, superactive, mesic Aridic Calciustept.

Profile 60. Manzanst Taxadjunct Family: very fine, mixed, superactive, mesic Aridic Haplustalf.

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Soil Pit Photos
Appendix E

Box Photos
Appendix F

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