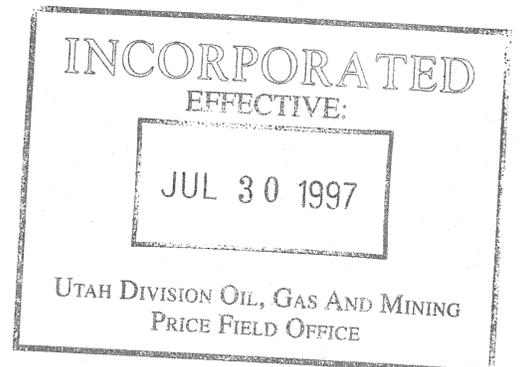


**APPENDIX 3-15**

**PRODUCTIVITY ESTIMATES (NCRS) - EXPANSION AREA**



UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

NATURAL RESOURCES  
CONSERVATION  
SERVICE

PRICE FIELD OFFICE  
350 NORTH 400 EAST  
PRICE, UTAH 84501

Patrick D. Collins, Ph.D.  
Mt. Neb Scientific  
330 E.400 S. Suite 6  
Springville, Ut. 84563

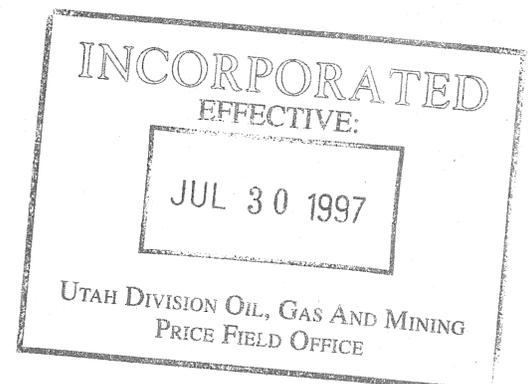
Dear Patrick:

Listed in the table are the area, condition, and production of the areas around the Genwal Mine.

SITE	AREA	CONDITION	PRODUCTION
Spruce Fir Aspen	Reference area	Good	2500 lbs.
Spruce Fir Aspen	Proposed disturbed	Good	2500 lbs.
Spruce Fir Aspen	Previously Disturbed	Fair	1000 lbs.
Riparian area	Reference area	Good	1500 lbs.

The method used to determine herbage production and site condition was ocular estimate. The production figures are based on air dry herbage per acre.

*George S. Cook*  
George S. Cook  
Range Conservationist



**APPENDIX 3-16**

**DWR RAPTOR SURVEY (2003)**

INCORPORATED  
FEB 28 2005  
DIV OF OIL GAS & MINING

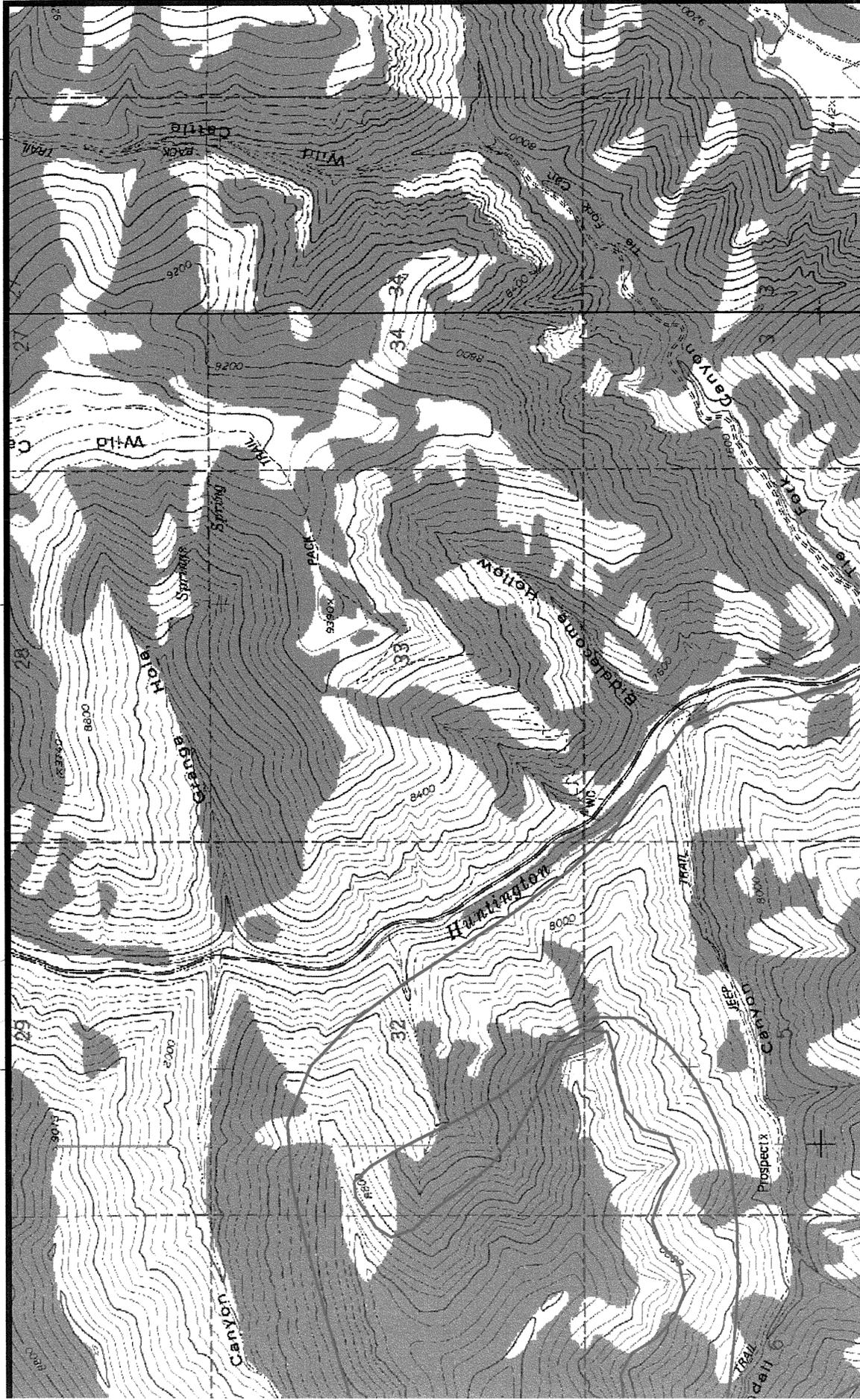
490000

488000

486000

43700

43680



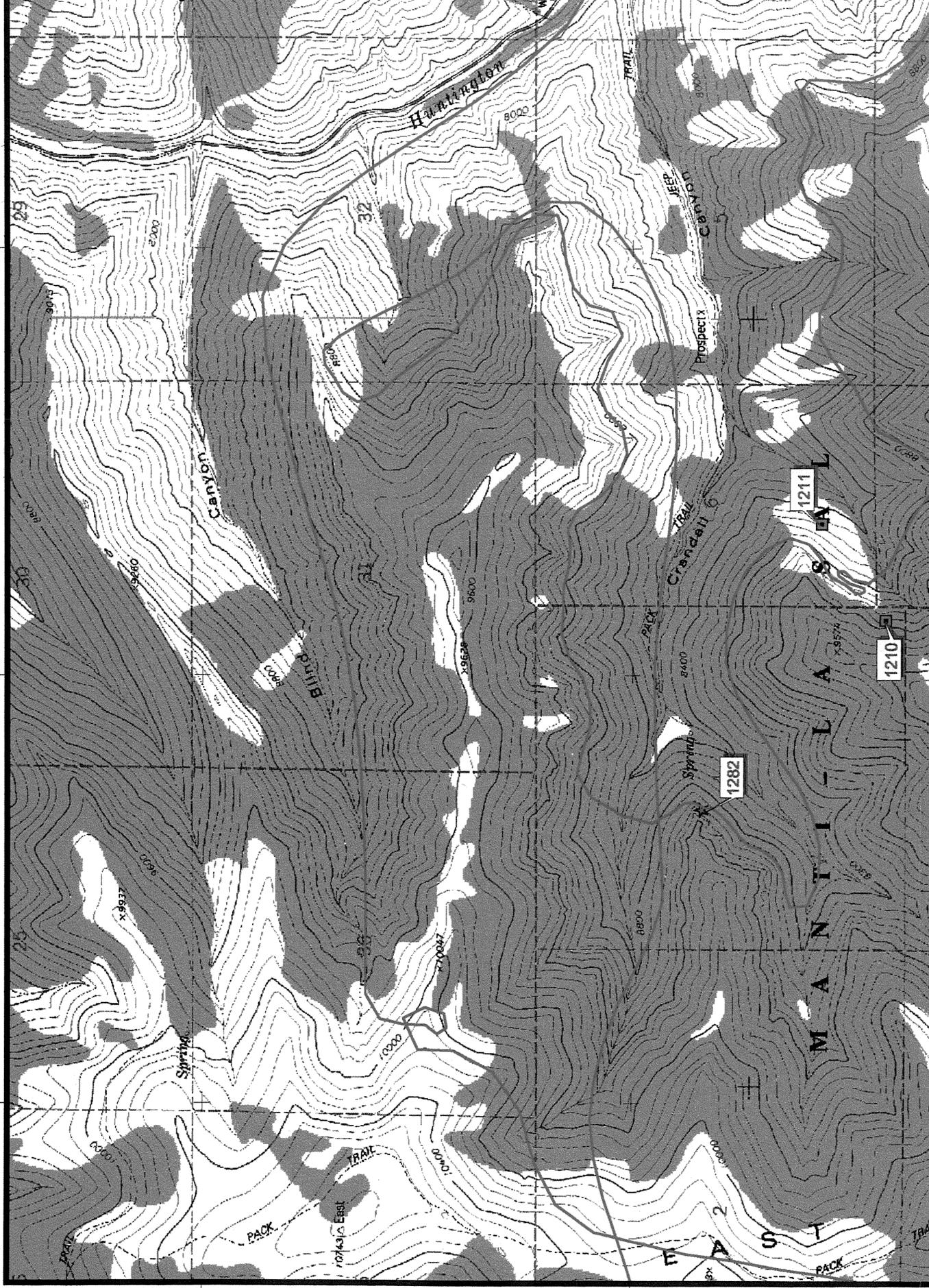
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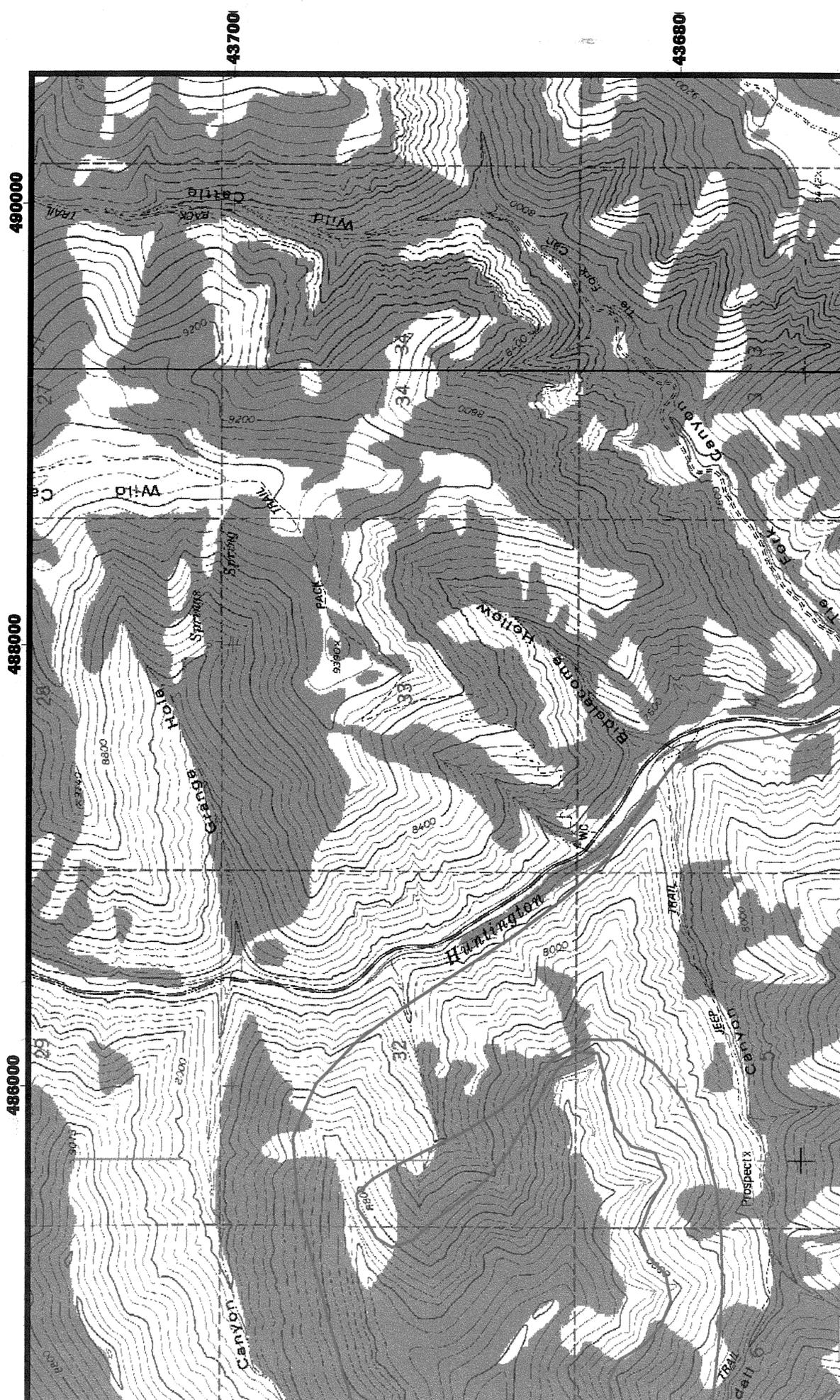
4368000



1211

1210

1282



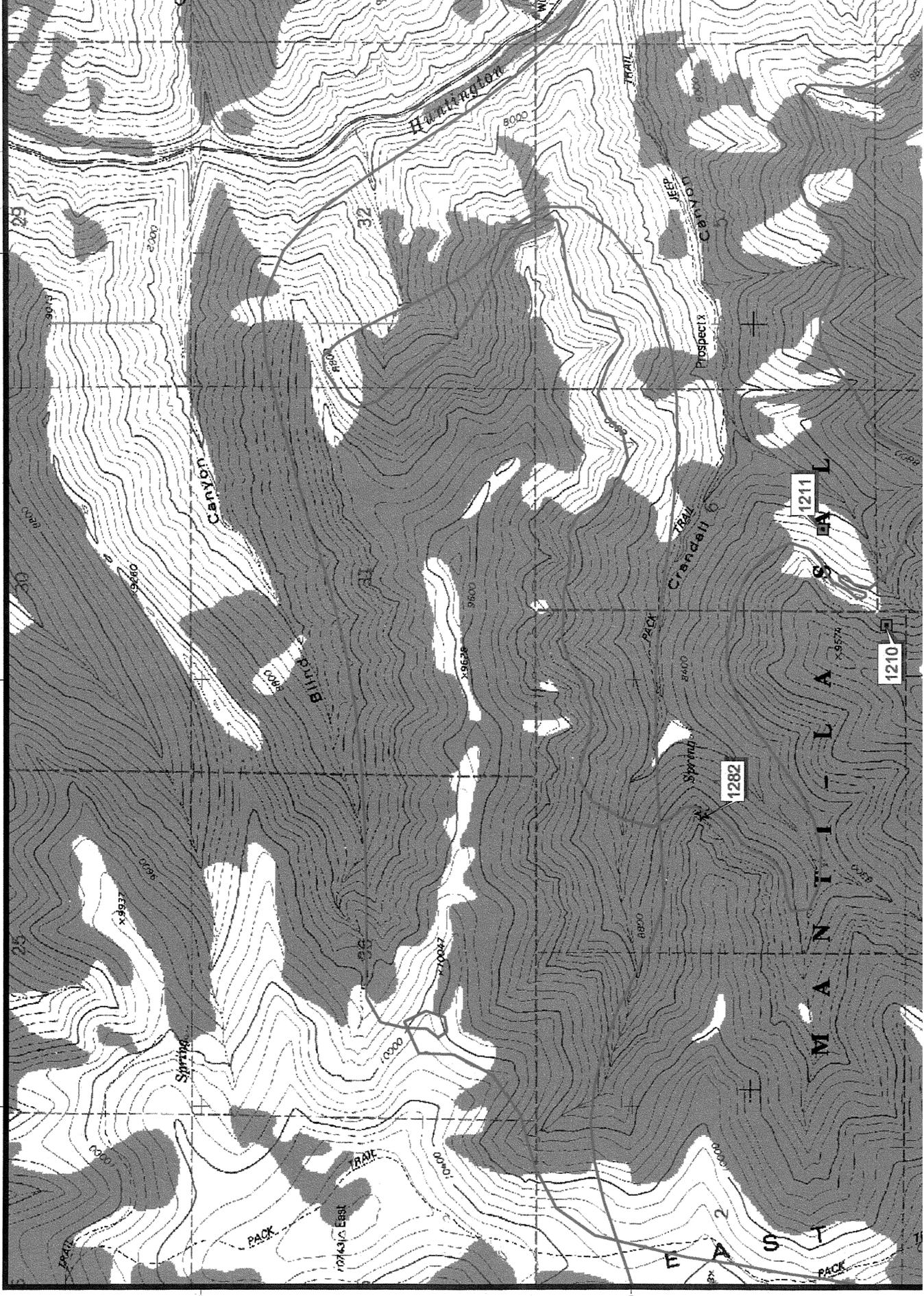
486000

484000

482000

4370000

4368000



**APPENDIX 3-16A**

**DWR RAPTOR SURVEY (2004)**

**INCORPORATED**  
**FEB 28 2005**  
**DIV OF OIL GAS & MINING**

# Raptor Survey Genwal 2004

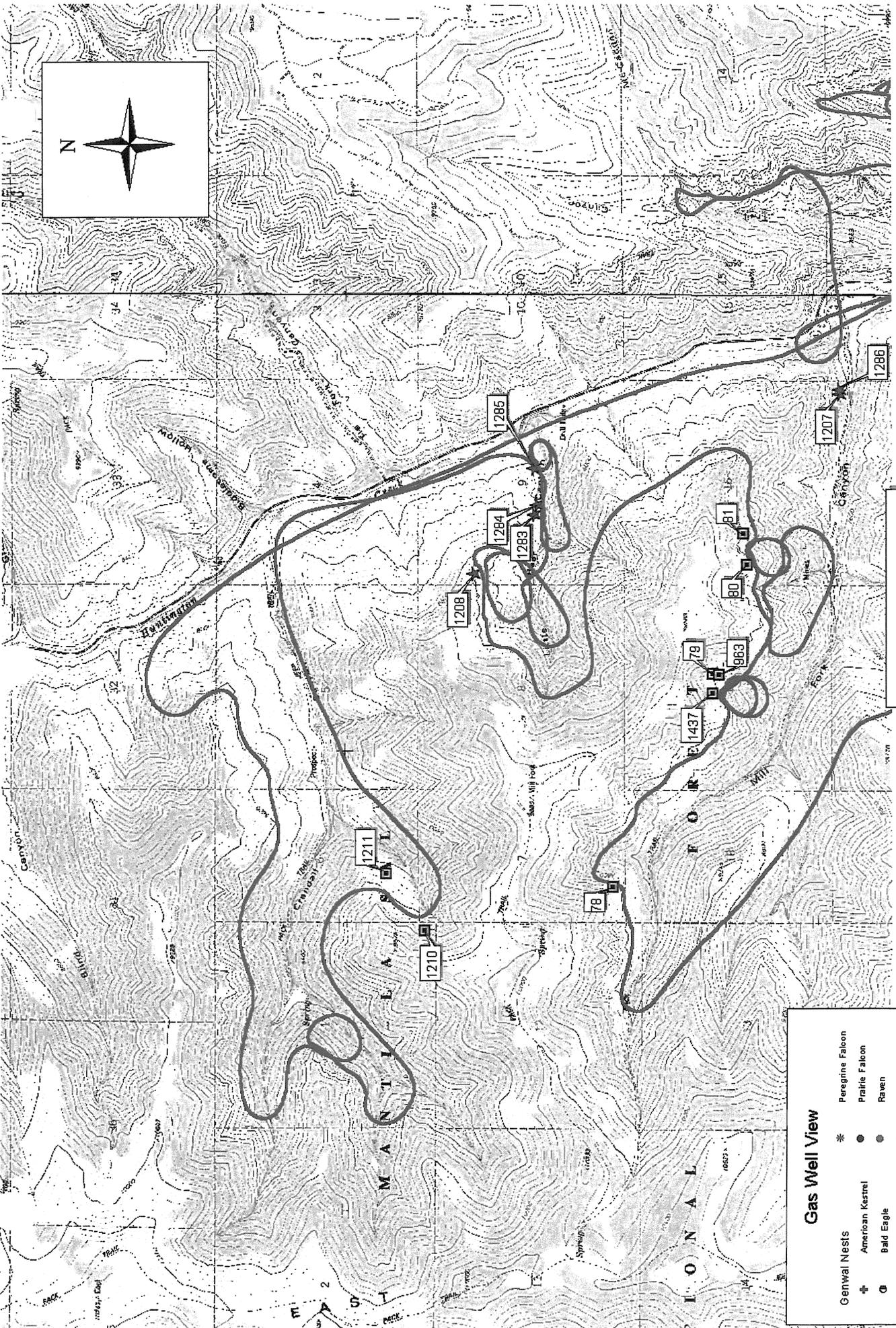
17 June 2004

Anthony Wright  
475 W. Price River Drive  
Price, UT 84501

STATE OF UTAH  
NATURAL RESOURCES  
Division of Wildlife Resources

**Gas Well View**

+	American Kestrel	*	Peregrine Falcon
o	Bald Eagle	●	Prairie Falcon
●	Cooper's Hawk	●	Raven
●	Falcon	★	Red-tailed Hawk
●	Ferruginous Hawk	●	Unknown
□	Golden Eagle	★	Buteo
▲	Great Horned Owl	—	2004 Flightlines



Attributes of Genwal_out.shp												
Nest_no	X_utm27	Y_utm27	Date	Species	Type	Status_04	Eggs	Yng	Age	Comments	Status_03	Status02
78	484600	4365349	20040519	Golden Ea	Cliff	inactive					inactive	Tended
79	486275	4364567	20040519	Golden Ea	Cliff	inactive					tended	Tended
80	487129	4364303	20040519	Golden Ea	Cliff	inactive					tended	Active
81	487376	4364333	20040519	Golden Ea	Cliff	inactive					tended	Inactive
963	486269	4364520	20040519	Golden Ea	Cliff	tended				greenry	Tended	Tended
1207	488466	4363584		Red-tailed	Cliff	not survey					not survey	Active
1208	487059	4366448	20040519	Red-tailed	Cliff	inactive				North side	inactive	Inactive
1210	484259	4366818	20040519	Golden Ea	Cliff	inactive					inactive	Active
1211	484707	4367115	20040519	Golden Ea	Cliff	tended				greenry	tended	Inactive
1282	483368	4367679	20040519	raven	Cliff	active		5		red-tail las	inactive	Inactive
1283	487524	4365966	20040519	Red-tailed	Cliff	inactive				.	inactive	Inactive
1284	487601	4365948	20040519	Red-tailed	Cliff	inactive				.	inactive	Inactive
1285	487886	4365975	20040519	Red-tailed	Cliff	inactive				.	inactive	Inactive
1286	488502	4363583		Red-tailed	Cliff	not survey				.	not survey	Inactive
1437	486119	4364571	20040519	Golden Ea	Cliff	not found					inactive	NA

Status01	Status00	Status99	Status98	Elevation	Company	Quad
Inactive	Tended	Inactive	Active	8900	Genwal	Rilda Canyon
Inactive	Tended	Tended	Dilapidated	8800	Genwal	Rilda Canyon
Active	Active	Inactive	Inactive	8700	Genwal	Rilda Canyon
Inactive	Inactive	Dilapidated	Inactive	8800	Genwal	Rilda Canyon
Inactive	Tended	NA	NA	8800	Genwal	Rilda Canyon
Active	NA	NA	NA	7200	Genwal	Rilda Canyon
Inactive	NA	NA	NA	8800	Genwal	Rilda Canyon
Tended	NA	NA	NA	9000	Genwal	Rilda Canyon
Dilapidated	NA	NA	NA	8900	Genwal	Rilda Canyon
NA	NA	NA	NA	9000	Energy We	Rilda Canyon
NA	NA	NA	NA	7600	Energy We	Rilda Canyon
NA	NA	NA	NA	7600	Energy We	Rilda Canyon
NA	NA	NA	NA	7600	Energy We	Rilda Canyon
NA	NA	NA	NA	7300	Energy We	Rilda Canyon
NA	NA	NA	NA		Energy We	RILDA CANYON

**APPENDIX 3-18**  
**WATER DEPLETION**

**INCORPORATED**  
**APR 15 2005**  
**DIV OF OIL GAS & MINING**

## WATER DEPLETION

### 1. Mining Process Water

Water lost due to use in mining process - measured as percentage moisture of coal hauled to customer.  $2,000,000 \text{ tons/yr} \times 2\% = 29.4 \text{ acre feet}$

### 2. Ventilation Evaporation

Water lost due to ventilation currents drying out mine water.

Estimated at 2.5 gallons per million cfm annually.

Estimated maximum 1,000,000 million cfm at 2.5 gallons = 40 acre feet.

### 3. Sediment Pond Evaporation

Water lost to evaporation in sediment pond.

Estimated to be one acre foot per year.

### 4. Subsidence Effect on Springs

Estimated at zero because of no known effects of spring disruption.

### 5. Direct Use

Pumped from creek for crusher building use - goes into sediment pond.

Estimated at 2 acre feet per year in use but is not actually lost. Assume no loss.

### 6. Alluvial Loss

None

### 7. Deep Aquifer Pumpage

None

### 8. Mine Discharge

Genwal has discharged at 500 gpm (approximately 800 acre feet per year) for the past 6 years. This is all old water according to the Mayo age dating studies. This is water that enters the watershed, therefore there is presently a net gain to the watershed of more than 700 acre feet:

$800 - (29.4 + 40 + 1) = 800 \text{ ac.ft. added, less } 70.4 \text{ ac.ft. depleted} = 729.6 \text{ ac.ft.}$

INCORPORATED  
APR 15 2005  
DIV OF OIL GAS & MINING

**APPENDIX 3-19**

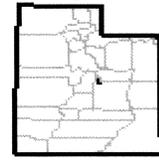
**DWR HABITAT INFORMATION, 2004**

**INCORPORATED**

**APR 15 2005**

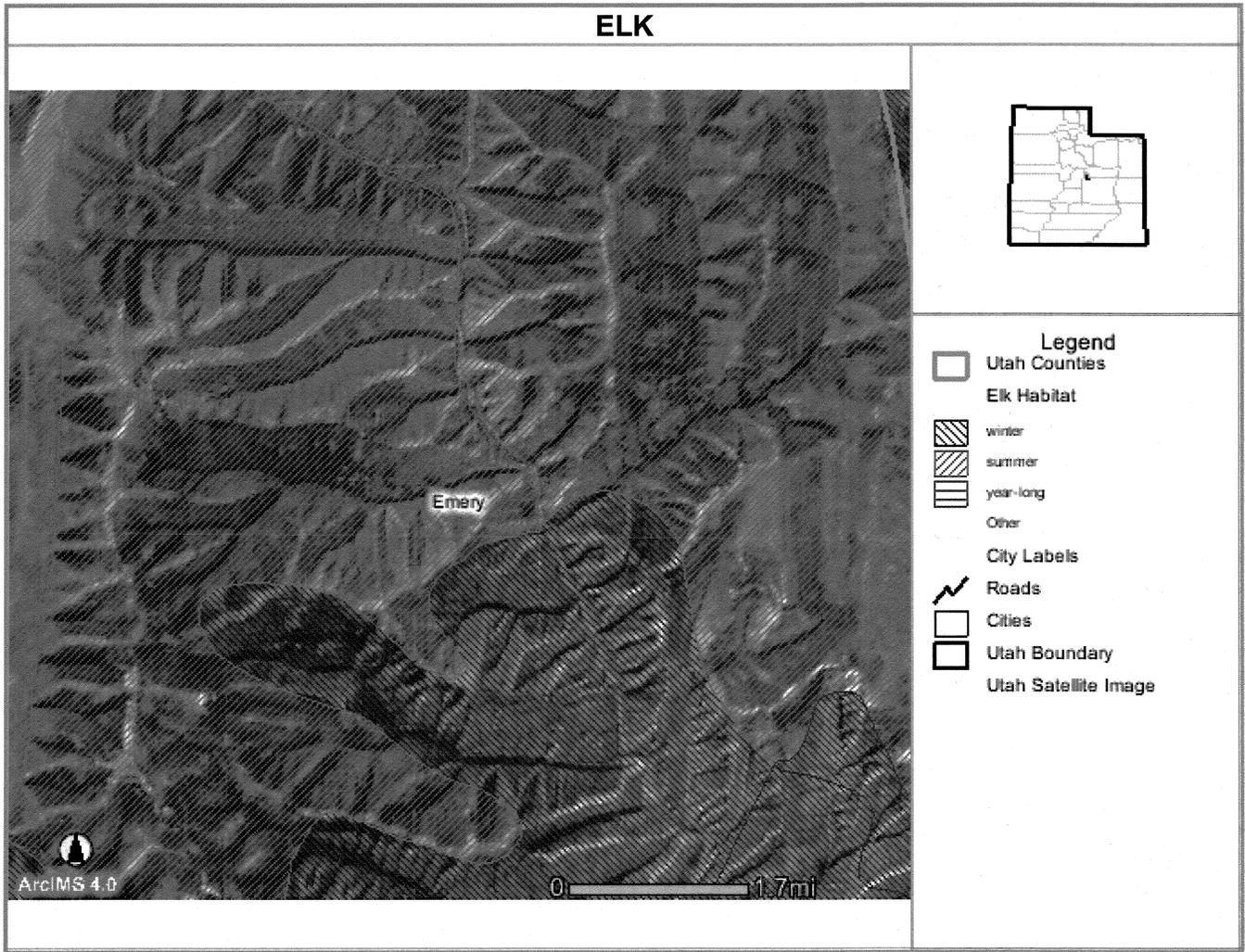
**DIV OF OIL GAS & MINING**

# MOOSE

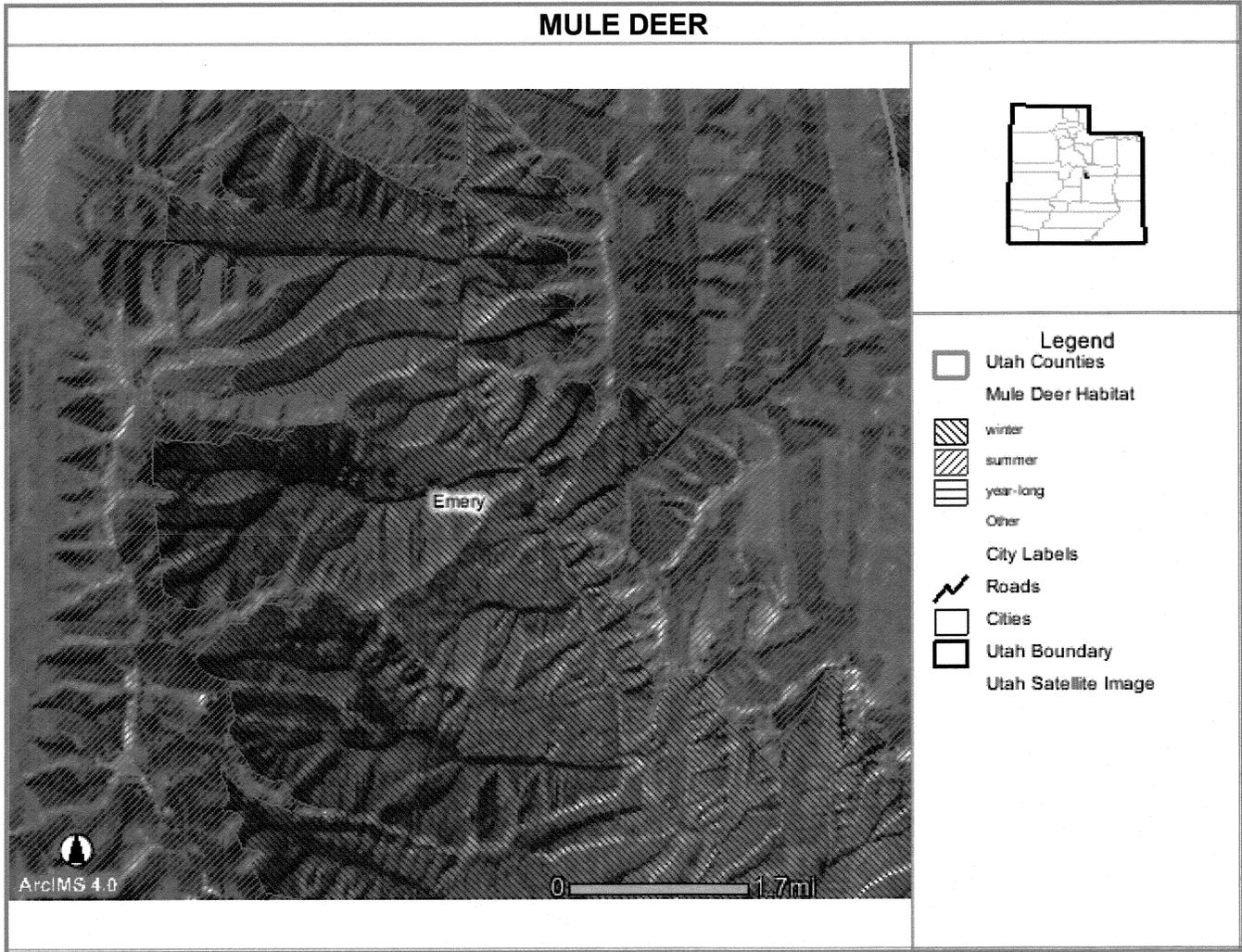


- Legend**
-  Utah Counties
  - Moose**
    -  winter
    -  summer
    -  year-long
    -  Other
  - City Labels**
  -  Roads
  -  Cities
  -  Utah Boundary
  - Utah Satellite Image

**INCORPORATED**  
**APR 15 2005**  
**DIV OF OIL GAS & MINING**



**INCORPORATED**  
**APR 15 2005**  
**DIV OF OIL GAS & MINING**



**APPENDIX 3-20**  
**FINAL ENVIRONMENTAL ASSESSMENT**  
**MODIFICATION OF FEDERAL COAL LEASE UTU-68082,**  
**U.S. FOREST SERVICE**

INCORPORATED  
FEB 20 2005  
DIV OF OIL GAS & MINING

**FINAL  
ENVIRONMENTAL ASSESSMENT  
MODIFICATION OF FEDERAL COAL LEASE UTU-68082**

**MANTI-LA SAL NATIONAL FOREST  
FERRON-PRICE RANGER DISTRICT  
EMERY COUNTY, UTAH**

**Joint Lead Agencies:** **USDA Forest Service**  
Manti-La Sal National Forest  
599 West Price River Drive  
Price, Utah 84501  
(435) 637-2817

**USDI Bureau of Land Management**  
Utah State Office  
324 South State Street, Suite 301  
Salt Lake City, Utah 84111  
(801) 539-4031

<b>Responsible Officials:</b>	<b>Alice Carlton</b> Forest Supervisor Manti-La Sal National Forest 599 West Price River Drive Price, Utah 84501	<b>Sally Wisely</b> Utah State Director Bureau of Land Management 324 South State Street, Suite 301 Salt Lake City, Utah 84111
-------------------------------	--	--

**Cooperating Agency:** **USDI Office of Surface Mining Reclamation and Enforcement**  
Western Regional Coordinating Center  
1999 Broadway, Suite 3320  
Denver, Colorado 80202-5733

<b>For Further Information Contact:</b>	<b>Karl Boyer</b> Geologist Manti-La Sal National Forest	<b>Gregg Hudson,</b> Geologist Bureau of Land Management
---	--	--

**Abstract:** This Environmental Assessment (EA) considers, the environmental, social, and economic effects of coal mining within a 120 acre modification to Federal Coal Lease Tract UTU-68082, if it is leased by GENWAL Mining Company. Leasing of the modification would make the coal available for energy production. The proposed action is to provide a list of special coal lease stipulations for incorporation into the coal lease agreement, and to later consent to the mine plan for the tract. The EA evaluates the potential effects of underground mining within the tract and adjacent lands. The Forest Supervisor must decide what coal lease stipulations to provide to the Bureau of Land Management to incorporate into the coal lease. After leasing, the Forest Supervisor must decide whether to consent to the lease.

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**FINAL  
ENVIRONMENTAL ASSESSMENT  
CRANDALL CANYON MINE  
MODIFICATION OF FEDERAL COAL LEASE  
UTU-68082**

**CHAPTER 1  
PURPOSE AND NEED**

**1.1 PROPOSED ACTION**

The proposed action is for the Bureau of Land Management (BLM) to modify Federal Coal Lease UTU-68082 by adding 120 acres. The Forest Service proposes to consent to the modification, subject to all lease terms, conditions, and stipulations contained in the original lease, and any additional stipulations needed to address surface effects in the modification area consistent with Forest Plan direction. This action would enable Genwal Resources Inc. (Genwal) to economically recover the available coal reserves within the proposed lease modification area and is in keeping with the BLM and Forest Service missions of providing the opportunity to recover leasable minerals on National Forest System Lands consistent with requirements for managing other resources.

**1.2 PROJECT DESCRIPTION**

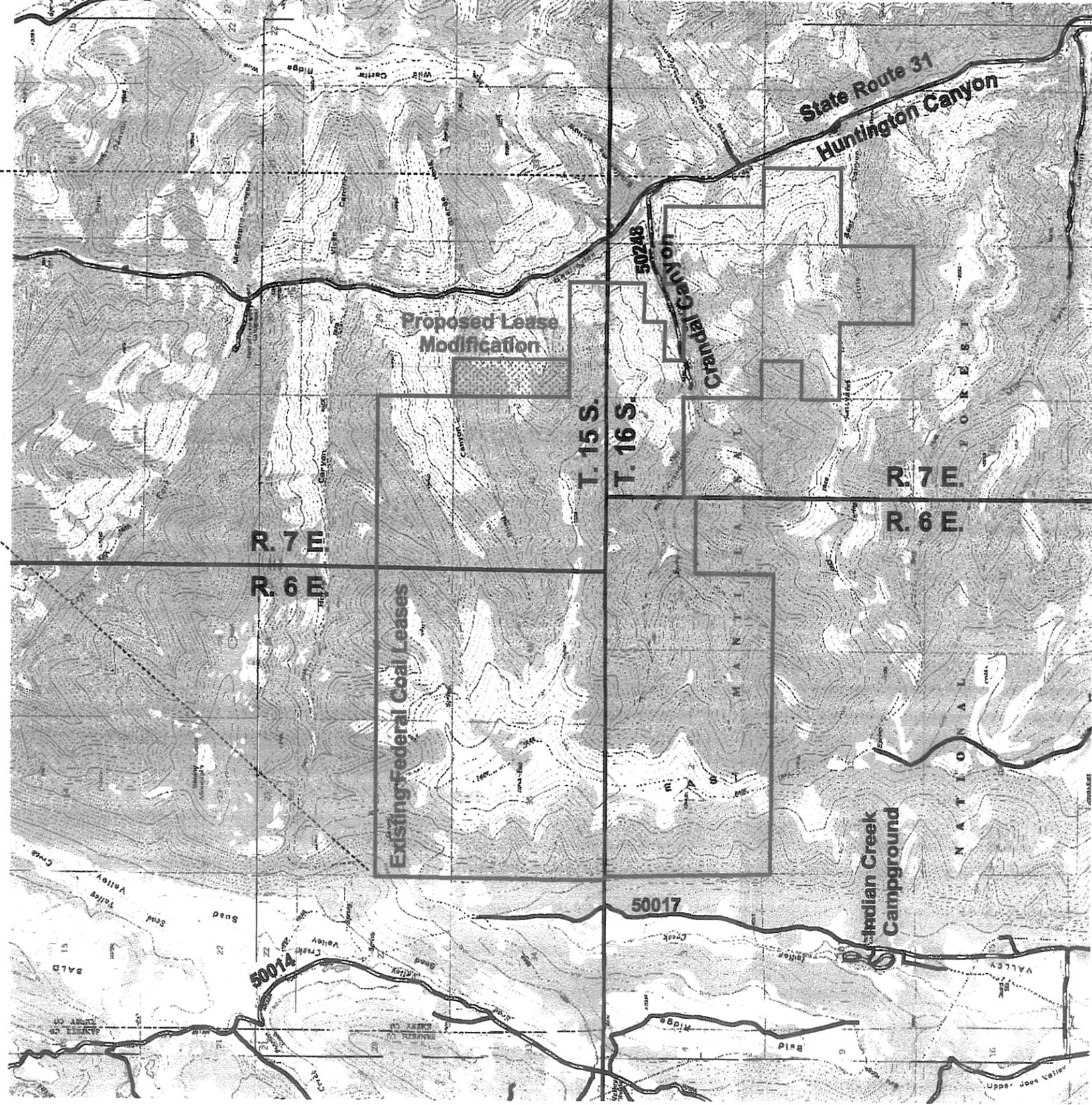
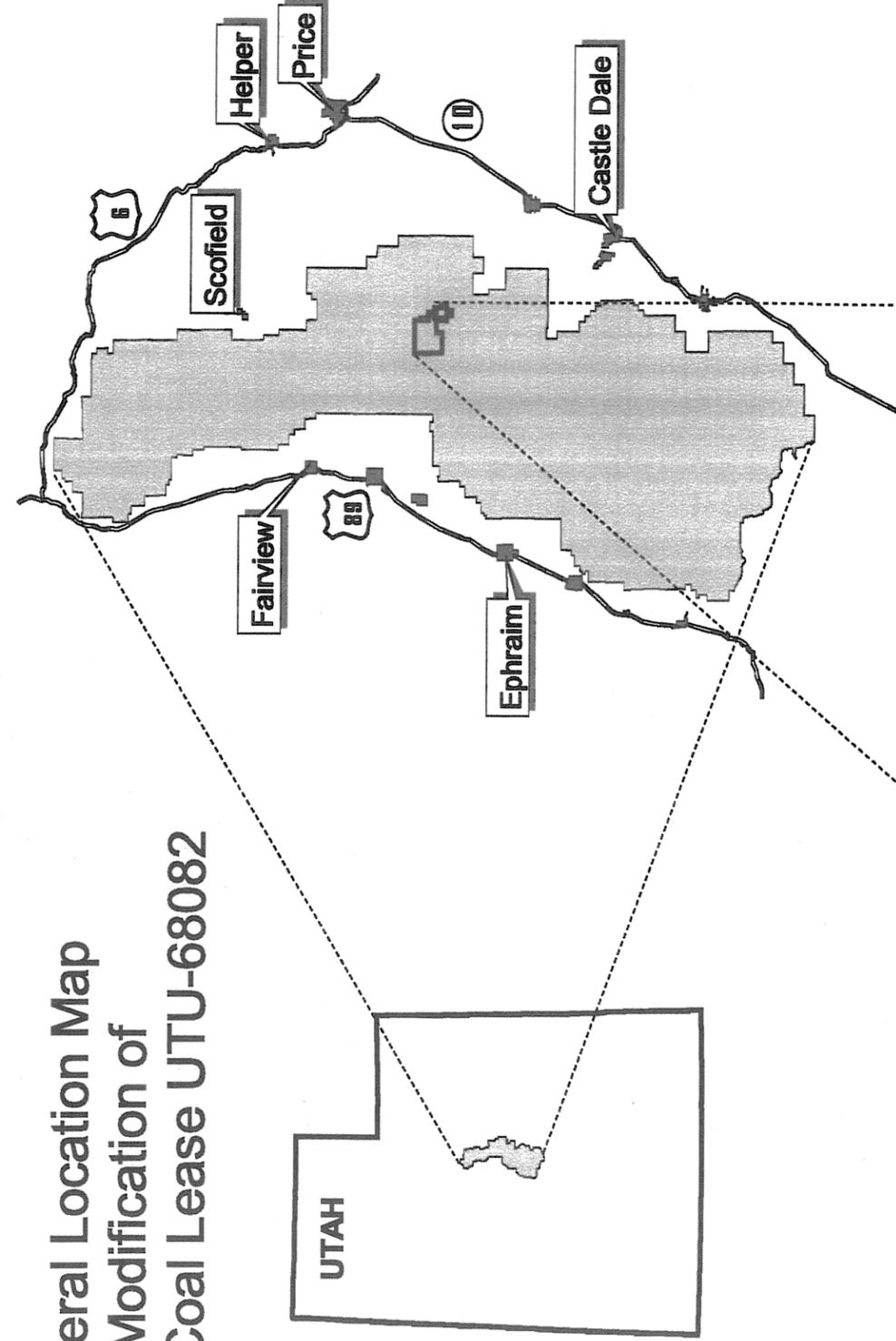
Genwal submitted an application for modification of Federal Coal Lease UTU-68082 to the BLM on February 27, 2004. The lease modification lies entirely within the boundaries of the Manti-La Sal National Forest. The proposed modification area, located immediately adjacent to the east side of UTU-68082, was originally excluded from the delineated tract due to low coal seam thickness. The proposed lease modification involves adding 120 acres of National Forest System lands administered by the Manti-La Sal National Forest in Emery County, Utah described as follows (Figure 1, Page 2):

T. 15 S., R. 7 E., SLM, UT  
Section 32, W1/2 NW1/4; NW1/4 SW1/4

The coal reserves in the proposed 120 acre lease modification would be approached from the south or west through existing underground mine workings in the Crandall Canyon Mine. No roads or portal facilities would be constructed for this project. The proposed lease modification area is an isolated area adjacent to the current lease. The proposed action would not lead to other future mining actions.

Figure 1

General Location Map  
Modification of  
Federal Coal Lease UTU-68082



1:50000

5 Miles

4

3

2

1

0

1

### 1.3 PURPOSE AND NEED

The Bureau of Land Management (BLM) has made a determination as per 43 CFR 3432.2 (a) that: (1) the modification serves the interests of the United States; (2) there is no competitive interest in the lands or deposits; and (3) the additional lands or deposits cannot be developed as part of another potential or existing independent operation. Therefore there is a need to modify the existing coal lease versus processing a lease by application under 43 CFR 3425.

The purpose of the lease modification is to recover the potentially available coal reserves in the proposed lease modification area, with mitigations needed to protect non-coal resources. If the coal reserves are not mined concurrently with UTU-68082, the coal would probably be bypassed and never mined. The proposed and reasonably foreseeable underground mining would consist of entries with support pillars and long wall extraction methods.

### 1.4 SCOPE OF THIS ENVIRONMENTAL ANALYSIS

#### 1.4.1 Scoping Process

Project scoping was conducted from May 4 to July 8, 2004. Comments were requested from Interdisciplinary Team (IDT) members, other Federal agencies, State, county and local agencies within Utah, Indian tribes, environmental groups, and interested individuals. Requests for comments were published in the *Sun Advocate* and *Emery County Progress* newspapers on May 4 and June 8, 2004. The project has been listed in the Forest Service Quarterly Schedule of Proposed Actions. Letters requesting comments were sent to 77 interested parties. Four outside responses were received. From these outside responses and the internal scoping, the IDT identified potential issues that are identified in Section 1.4.3.

The following is a summary of the outside responses that were received:

- 1) Utah Environmental Congress (UEC) requested that a cumulative effects analysis be completed for Management Indicator Species (MIS), wolverines, and Threatened, Endangered, and Protected Species (TEPS) on the Forest, and for the watersheds originating on the Wasatch Plateau. They also requested that the analysis address potential disruption to suitable habitat for migratory birds.
- 2) The Hopi Tribe requested a copy of the Cultural Resource Survey Report of the project to assist them in determining whether the area of potential effect contained any cultural resources significant to the Hopi Tribe.
- 3) The U.S. Fish and Wildlife Service was primarily concerned with the loss of perennial surface water and the disruption of springs and seeps due to mining subsidence, and the effects that the loss of water would have on wildlife habitat.
- 4) The Navajo Nation stated that they did not have any immediate concerns with the project and that the project area would not impact any Navajo Traditional Cultural Properties.

## 1.4.2 Relevant Planning Documents and Analyses

1) The Land and Resource Management Plan (LRMP) for the Manti-La Sal National Forest on page III-4 states that the Forest Management Goals for Minerals and Geology are to:

- a. Provide for the interpretation of surface and subsurface geologic conditions and processes such as landsliding.
- b. Manage geologic resources, common variety minerals, ground water, and underground spaces (surficial deposits, bedrocks, structures, and processes) to meet resource needs and minimize adverse effects.
- c. Provide appropriate opportunities for and manage activities related to locating, leasing, exploration, development, and production of mineral and energy resources
- d. Ensure that adequate reclamation of disturbed areas is accomplished.

2) Chapter III of the LRMP prescribes Management Requirements for the lease modification area:

- a. Management Activity: Leasable Minerals (LRMP, Page III-35).  
General Direction 01- Negative recommendations, denials, or consent for leasing, permitting, or licensing will be based on site-specific environmental assessments using appropriate standards and guidelines. Stipulations for these actions should minimize and/or mitigate effects or conflicts with other resource uses and should return disturbed lands to conditions compatible with emphasis on the management unit or adjacent management unit.
- b. Management Activity: Range (LRMP, Page III-66).  
General Direction 01- Provide appropriate mitigation measures to assure continued livestock access and use.  
  
General Direction 02- Those authorized to conduct developments will be required to replace losses through appropriate mitigations, where a site-specific development adversely affects long term production or management.

3) Crandall Canyon Mine EA, September 1997

4) Mill Fork Tract EA, June 1997

## 1.4.3 Issues Evaluated in Detail

### 1.4.3.1 Surface Water

In areas of low overburden, subsidence fractures could be continuous to the surface. Surface water in either perennial drainages or seasonal and ephemeral runoff could be disrupted and/or intercepted by the underground mine workings. This could affect ecosystems, stream morphology, and stream flows.

Evaluation Criteria:

- Evaluate effects to drainages by classification (perennial, intermittent, or ephemeral), in feet.
- Acres and duration of impacted wetland and riparian areas.

#### **1.4.3.2 Ground Water**

In areas of shallow overburden, interception of ground water by the mine workings could disrupt the sources and flow paths supplying springs and seeps.

Evaluation Criteria:

- Number of springs and volumes affected.

#### **1.4.3.3 Escarpment Failure**

The Castlegate Sandstone is located along the western edge of the proposed lease modification. Subsidence could result in the failure of the Castlegate escarpment; causing effects to visual resources and raptor nesting habitat, and resulting in increased erosion and sediment production.

Evaluation Criteria:

- Visuals (consistency with Visual Quality Objectives).
- Raptor Nests (number of nests and acres of lost habitat).
- Erosion and Sedimentation (effects to water quality).

#### **1.4.3.4 Wildlife**

Subsidence and possible loss of surface and ground water could affect Management Indicator Species (MIS), Macroinvertebrates, Migratory Bird Species, Threatened, Endangered and Sensitive Plant and Animal Species and their habitat.

Evaluation Criteria:

- Effects to suitable habitat.
- Presence of species.

### **1.4.4 Issues Considered but Not Further Evaluated**

#### **1.4.4.1 Range**

No conflicts are anticipated with the lease proposal as far as impacts to available livestock forage. No surface facilities or roads would be constructed for this project; therefore, noxious weed introduction is not an issue.

#### **1.4.4.2 Cultural and Paleontological Resources**

##### **a. Paleontological Resources.**

The Forest Service conducted paleontological inventories in the East Mountain area from 1998 to 2001. No potential sites were located in the proposed lease modification area.

##### **b. Archaeological Resources.**

The area was surveyed for potential historic or archaeological resources in June 2004. None were found and the potential effects have been determined to be negligible. No known objects on or adjacent to the lease tract are listed in or are eligible for the National Register of Historic Places. No significant heritage resources will be affected by the action. A letter received from the Utah State Historic Preservation Office states that no historic properties would be affected in the area.

Initial scoping documents were sent to the tribal governments of the Hopi, Paiute, Ute Mountain Ute, White Mesa Ute, Ute Tribe (Fort Duchesne), and Navajo beginning in May of 2004. Two tribes, The Navajo and the Hopi, responded to the scoping documents, indicating a general concern for avoiding potential impacts to cultural resource sites. All of the tribes listed above were sent copies of the cultural resources inventory report associated with the project. This communication also included a request for information regarding any potential sacred sites, TCP's (Traditional Cultural Properties), and plants or other natural resources the tribes might have concerns with. No Traditional Cultural Properties or sacred sites were identified in the analysis area through these consultation efforts. A list of culturally significant plants provided by the Paiute was submitted to the Forest botanical expert for review. There are no sensitive or threatened species on that list and those species on the list that occur in the project area will not be negatively affected by the proposed action.

Should any unanticipated paleontological or cultural resources be encountered during the implementation of this project, all work would stop until assessment of the finding could be made.

#### **1.4.4.3 Roadless Area**

The proposed coal lease modification lies within the East Mountain Roadless Area. The undeveloped character of the roadless area would not be affected. No roads or portal facilities would be constructed for this project. The proposed lease modification is an isolated area adjacent to the current lease; it contains a small amount of mineable coal accessible only through the existing mine in the current lease. The proposed action would not lead to other future mining actions. The coal lease modification would be mined entirely by underground mining methods and adjacent existing underground mine workings would access the tract. The amount of subsidence would be minimal, approximately 3 feet.

## **1.5 DECISIONS THAT MUST BE MADE**

The Utah State Director of BLM must decide whether or not to modify the lease and under what terms, conditions, and stipulations. The Bureau of Land Management (a joint lead agency) is responsible for issuance and administration of coal leases under the Mineral Leasing Act of 1920, as amended and Federal Regulations 43 CFR 3400.

The Forest Supervisor of the Manti-La Sal National Forest must decide whether or not to consent to the lease modification by BLM, and prescribe lease stipulations needed to protect non-mineral resources. The Federal Coal Leasing Amendments Act of 1975 that amended the Mineral Leasing Act of 1920 provides Forest Service consent authority.

The Forest Supervisor would also consent to any approval of the associated permit revision by Utah Division of Oil, Gas, and Mining, which would involve including this lease modification in the permit area.

The Office of Surface Mining Reclamation and Enforcement is a cooperating agency in this action.

## **1.6 APPLICABLE LEGAL AND REGULATORY REQUIREMENTS AND COORDINATION**

The decisions must conform to the overall guidance of the Manti-La Sal National Forest Plan (1986), as amended, and its Final Environmental Impact Statement (FEIS), 1986. This environmental analysis tiers to the Forest Plan FEIS.

This coal lease modification will be processed under the authority of the Mineral Leasing Act of 1920. Approving the lease modification would give the lessee an exclusive right to mine the coal, but does not authorize mining or surface disturbing activities.

Before any lease development can occur, the operator must obtain approval of a comprehensive Mining and Reclamation Plan and a mine permit in accordance with the state and Federal Regulations. Surface management agency (in this case the Forest Service) consent and incorporation of provisions for protection of non-mineral resources are required prior to issuing a permit. Approval of a Resource Recovery and Protection Plan under 43 CFR 3482 and consent from the BLM are also required.

The Surface Mining Reclamation and Control Act of 1977 (SMCRA) gives the Department of the Interior, Office of Surface Mining (OSM) primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. In January 1981, pursuant to Section 503 of SMCRA, the Utah Division of Oil, Gas and Mining (DOGGM) developed, and the Secretary of the Interior approved, a permanent program authorizing Utah DOGGM to regulate surface coal mining operations and surface effects of underground mining on non-Federal lands within the state of Utah. In March 1987, under Section 523(c) of SMCRA, Utah DOGGM entered into a cooperative agreement with the Secretary of the Interior authorizing Utah DOGGM to regulate surface coal mining operations and surface effects of underground mining on Federal lands within the State.

Under the cooperative agreement, Federal coal lease holders in Utah must submit permit application packages (PAP's) to OSM and Utah DOGM for proposed mining and reclamation operations on Federal lands in the State. Utah DOGM reviews the PAP to ensure that the permit application complies with the permitting requirements and that the coal mining operation will meet the performance standards of the approved permanent program. If it does comply, Utah DOGM issues the applicant a permit to conduct coal mining operations. OSM, the BLM, the Forest Service, and other Federal agencies, review the PAP to ensure that it complies with the terms of the coal lease, the Mineral Leasing Act of 1920 (MLA), NEPA, and other Federal laws and their attendant regulations. OSM recommends approval, approval with conditions, or disapproval of the PAP MLA mining plan to the Assistant Secretary, Land and Minerals Management.

Utah DOGM enforces the performance standards and permit requirements during the mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. BLM and the Forest Service have authority in those emergency situations where Utah DOGM or OSM inspectors can not act before environmental harm or damage occurs.

## CHAPTER 2 DESCRIPTION OF ALTERNATIVES

### 2.1 INTRODUCTION

This chapter presents the alternatives considered for implementation, features common to action alternatives, alternatives considered but not further analyzed, and a comparative summary table of the alternatives considered for implementation responding to the identified issues. A no action alternative and two action alternatives are considered in detail.

**Table 2-1, List of Alternatives**

<b>Alternative 1 – No Action</b>
<b>Alternative 2 – Consent/Approval of Project as Proposed</b>
<b>Alternative 3 – Consent/Approval of Project with Supplemental FS Mitigations</b>

### 2.2 HISTORY AND PROCESS USED TO FORMULATE THE ALTERNATIVES

Alternative development is driven by public comments and input from Forest Service personnel. Comments were sought by various means including newspapers, the Forest Service's *Schedule of Proposed Actions*, and by letters to State and County governments and other interested parties.

Letters requesting comments were sent to 77 interested parties. Four letters were received in response to the Forest's public involvement efforts. The contents of each letter were reviewed and issues identified that could help refine the analysis, project design, and development of alternative actions.

### 2.3 ALTERNATIVE DESIGN, EVALUATION, AND SELECTION CRITERIA

Action alternatives must be consistent with the rights granted to the lessee under Federal Coal Lease UTU-68082, as conditioned by the lease terms and stipulations contained therein. In addition, any occupancy and development of the lease must be consistent with all applicable, non-discretionary laws and regulations.

All alternatives must include implementation of Soil and Water Conservation Practices as detailed in the project file. This calls for all reasonable measures to be taken by the operator to prevent sediment caused by operations from entering adjacent drainages.

## **2.4 DESCRIPTION OF PROPOSED ALTERNATIVES**

### **Alternative 1 – No Action**

Alternative 1 addresses the need to provide a "No Action" alternative (40 CFR 1502.14). The Forest Service would not consent to, and the BLM would not approve the coal lease modification. Subsequently, Alternative 1 would not allow for mining within the modification area, and therefore not provide coal reserves for the mine. No mitigation measures or monitoring would be required as part of this alternative other than meeting Forest Plan direction, standards, and guidelines.

### **Alternative 2 – Consent/Approval of the Lease Modification as Proposed**

This alternative represents Genwal's proposal to modify Federal Coal Lease UTU-68082 to provide coal reserves for the Crandall Canyon Mine so that current production levels are maintained, and to recover Federally owned coal deposits that may otherwise be bypassed. The Utah State Director of BLM must decide whether or not to modify the lease to include the additional 120 acres. The Bureau of Land Management is responsible for issuance and administration of coal leases under the Mineral Leasing Act of 1920, as amended and Federal Regulations 43 CFR 3400. The Forest Supervisor of the Manti-La Sal National Forest must decide whether or not to consent to the lease modification by BLM, with terms and conditions as contained in Federal Coal Lease UTU-68082. The Federal Coal Leasing Amendments Act of 1975 that amended the Mineral Leasing Act of 1920 provides Forest Service consent authority. The Forest Supervisor would also consent to any approval of the associated permit revision by Utah Division of Oil, Gas, and Mining, which would involve including this lease modification in the permit area.

The 120 acre area would be added to Federal Coal Lease UTU-68082 for mining through their Crandall Canyon Mine. Because it is not a competitive bid process, another company would not be able to bid on the lease. The lease would be subject to those lease terms and conditions (stipulations) contained in Federal Coal Lease UTU-68082 (Appendix B).

### **Alternative 3 – Consent/Approval of the Proposed Lease Modification with BLM Stipulations and Supplemental Forest Service Stipulations**

This alternative is similar to Alternative 2 with application of an additional mitigation measure (Appendix C) designed to lessen anticipated environmental effects.

## **2.5 PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE ACTIONS**

CEQ regulations (40 CFR 1508.7) define cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency

(Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

Past, present, and reasonably foreseeable future actions in the project area have been developed in support of this EA. The cumulative effects for each resource category are addressed under each alternative in Chapter 4. Estimates of residual, current, or anticipated effects are discussed. The sum of the effects, in addition to the anticipated direct and indirect effects of the proposed action, will form the basis for the cumulative effects analysis.

If the lease modification is approved, no other future actions are planned for the 120-acre tract beyond removal of the coal reserves.

## 2.6 COMPARISON SUMMARY OF ALTERNATIVES

Table 2-2, Comparison of Alternatives, displays the components of each alternative and the physical changes to the environment likely to occur from the project for each alternative. These changes are not in themselves identified as issues, but would cause changes to resources and the socioeconomic setting and, therefore, form the basis for the identified issues.

**Table 2-2 Comparison of Alternatives**

Issue: Surface Water	Alternative 1	Alternative 2	Alternative 3
a. Impacts to drainages, by classification (in feet):			
1. Perennial	0	0	0
2. Intermittent	0	2200	1050
3. Ephemeral	0	2200	1050
b. Impacted wetland and riparian areas			
1. Acres	0	5.8	3.6
2. Duration (years)	0	permanent	0

Issue: Ground Water	Alternative 1	Alternative 2	Alternative 3
a. Impacts to springs/seeps			
1. Number of springs/seeps	0	8	5
2. Volumes (gpm)	0	0-10	0-5

Issue: Escarpment Failure	Alternative 1	Alternative 2	Alternative 3
a. Visuals			
1. Meets Forest VQO	Yes	Yes	Yes
b. Impacts to raptor nests			
1. Number of nests	0	0	0
2. Acres of lost habitat	0	0	0

<b>c. Erosion &amp; Sedimentation</b>			
1. Effects to water quality	No	Yes	No

<b>Issue: Wildlife</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>a. Impacts to wildlife</b>			
1. Effects to habitat	No	Yes	No
2. Presence of species	Yes	Yes	Yes

## **CHAPTER 3 AFFECTED ENVIRONMENT**

### **3.1 INTRODUCTION**

This chapter describes the affected environment, with emphasis on the identified issues.

This analysis tiers to the Manti-La Sal National Forest Land and Resource Management Plan (Forest Plan) and incorporates by reference the analysis disclosed in its Final Environmental Impact Statement and Record of Decision, 1986, as amended. Relevant Forest-wide and management area goals, direction, and standards from the Forest Plan are incorporated in this analysis and are further discussed in this chapter.

The proposed coal lease modification area is located between Crandall Canyon and Blind Canyon and overlooks Huntington Canyon. The Forest Plan identifies the Management Prescription (key map and pages III-64 to III-66) for the proposed site as Range Management (RNG), where the emphasis is on production of forage and cover for domestic livestock and wildlife. The proposed coal lease modification satisfies the requirements for management unit direction through the incorporation of the standard stipulations, best management practices, and additional measures as discussed in the alternatives.

### **3.2 DESCRIPTION OF AFFECTED RESOURCES**

#### **3.2.1 Surface Water**

The 120 acre lease modification area is located entirely within the Huntington Creek watershed (a tributary to the San Rafael River). Two tributaries to Huntington Creek drain the modification area; the northern part is drained by Blind Canyon and the central and southern portions are drained by Shingle Canyon Creek (Figure 2, page 16). Huntington Creek flows through the town of Huntington, Utah, and into Castle Valley, where the water is primarily used for agriculture and electrical power generation. A minor component of the water is used as the municipal water source for the town of Huntington.

The study area for surface water hydrology includes both streams (Blind Canyon and Shingle Canyon creeks) in the proposed 120 acre lease modification area plus an additional area that may be impacted by subsidence. The discussion regarding springs and seeps is found in Ground Water, Section 3.2.2.

A perennial stream has flowing water year-round during a typical year. The water table is located above the streambed for most of the year. Ground water is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for

streamflow (USACE, definitions for 2002 Nationwide Permits). The importance of springs in maintaining perennial streamflow is variable and ranges from a major to a supplemental source. A perennial stream is made up primarily of gaining or effluent segments. However, in arid environments, a stream may have losing or influent segments and still be considered perennial if the influent segment has perennial segments up and downstream of it. Note that the alluvial ground water that supports perennial stream segments originates in a variable source area upstream/up-gradient of the perennial segment. Intermittent streams typically occur in these portions of the source area. Intermittent streams flow during snowmelt runoff and are usually dry by late summer and early fall. Ephemeral streams only flow as a direct response to storm events.

The Mining and Reclamation Plan for the Crandall Canyon Mine (Vol. 6, Appdx. 7-48) discussed perennial flow in Blind Canyon. The perennial stream section extends from the confluence with Huntington Creek, upstream to as high as 9640 feet in elevation. Perennial flow is found along the entire length of (and beyond) the northern boundary of the proposed lease modification area. Recent investigations (Petersen, 2004, and Collins, 2004) also indicate that Blind Canyon is a perennial stream. Stream flow measurements and macroinvertebrate samples taken in Shingle Canyon Creek during these recent investigations indicate that it is not perennial. However, certain plant species found in the drainage leave open the possibility that the stream could be given a perennial designation. It is possible that Shingle Canyon could be intermittent in the upper reaches and perennial in the lower main stem. Additional surveys later in the growing season would be necessary in order to make a conclusive determination regarding the perennial status of this drainage. Base flow of the streams is probably supplied from springs and seeps, with additional flow contributed by snowmelt and rain.

The Forest Service has a water right on Blind Canyon Creek (93-182) from the intersection of the creek with the western boundary of Sec. 32 to its intersection with Huntington Creek for stock watering. The Forest Service also has a water right on Shingle Canyon Creek (93-1180) from the NE1/4SE1/4 Sec. 31, through Sec. 32, to its intersection with Huntington Creek for stock watering. No other water rights were found within the proposed lease modification area.

Information for the surface and ground water evaluations was derived from:

- Mining and Reclamation Plan, Genwal Mining Company
- Information and maps generated by the Forest Service, USGS, and Genwal
- Water rights data from the Utah Department of Natural Resources, Division of Water Rights
- Perennial Stream Considerations At "No-Name Creek" & Blind Canyon Creek, Tributaries To Huntington Canyon Creek, Mt. Nebo Scientific, Inc., June 2004
- A hydrologic investigation of the permit area conducted by Petersen Hydrologic

The State of Utah has assigned beneficial use designations and water quality standards to these waters. The beneficial uses include:

- 1C – protected for use as a raw water source for domestic water systems with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
- 2B – protected for secondary-contact recreation, such as boating, wading, or similar uses.
- 3A – protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.
- 4 – protected for agricultural uses, including irrigation of crops and stock watering.

### **3.2.2 Ground Water**

Eight springs and seeps (Figure 2, page 16) have been identified within the 120-acre lease modification area, with recorded discharge rates from 0 to 10 gpm. Flows were highest during the spring due to snowmelt and seasonal recharge. Seven of the springs have been completely dry at times. Five springs/seeps are located in areas of the proposed lease modification with less than 300 feet of overburden and 3 other springs/seeps are located in areas with 300 feet or more of overburden. Small riparian areas could be associated with these springs.

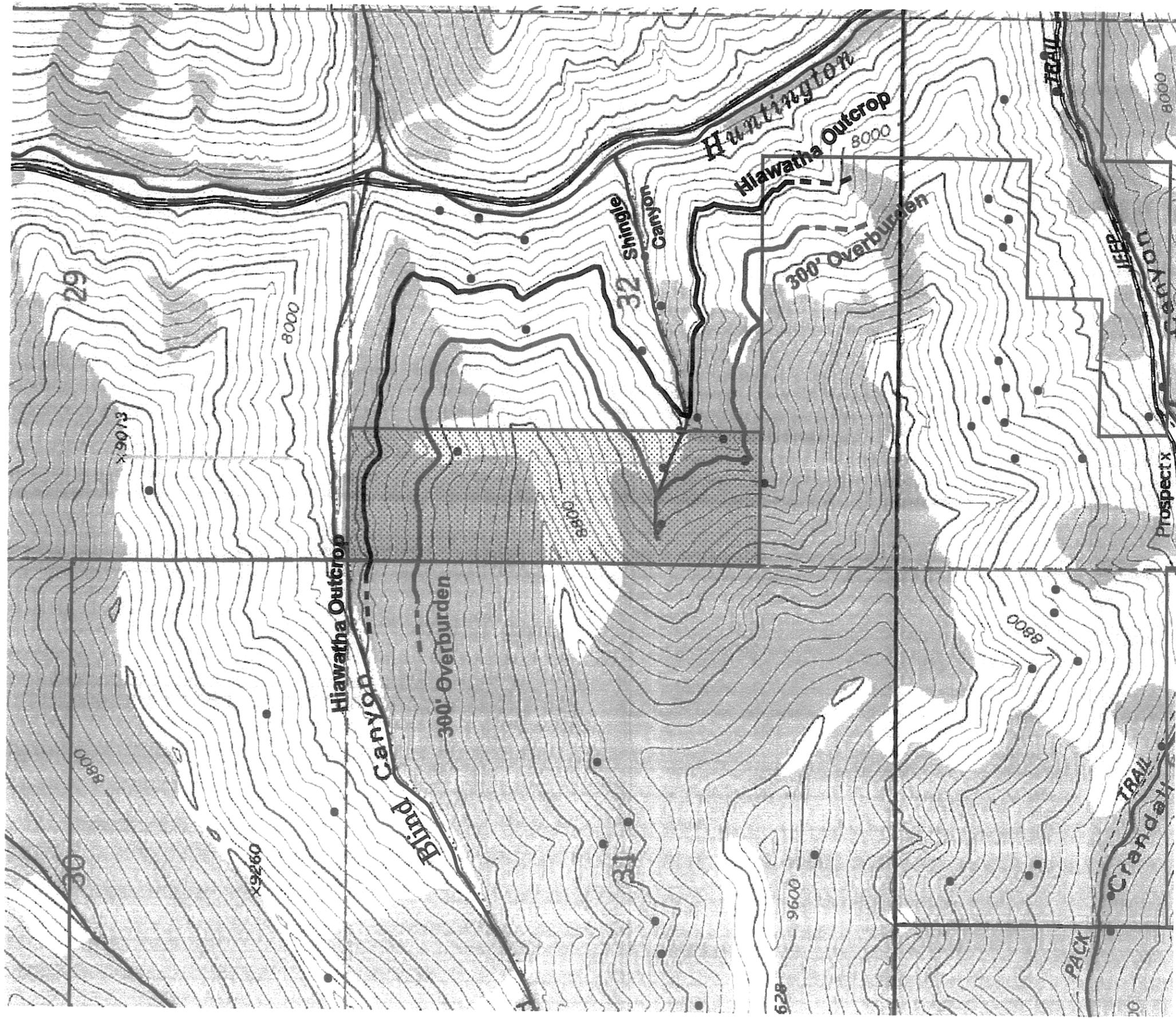
None of the springs and seeps have been developed. Some of them are used for livestock watering during the summer months. These springs are located in the Blackhawk Formation. Springs within the Blackhawk Formation generally occur under perched conditions. The Blackhawk is composed of layers of sandstone and shale. Water from snowmelt and precipitation events moves downward through porous layers of the formation until it comes in contact with an aquitard. The water then moves laterally along the top of the non-porous lens until it exits at an outcrop. Many such small seeps/springs occur within the Blackhawk Formation and overlying Price River Formation. Surface subsidence effects, which could affect flow patterns to springs and seeps, are associated with projects of this type on the Wasatch Plateau.

No faults are known to transect the proposed lease modification. As long as an appropriate overburden thickness was observed and the mine did not intercept surface water, water encountered within the mine would be from paleo-sandstone channels within the Blackhawk Formation and possible upwelling from the Star Point Sandstone. This water has been age dated to approximately 12,000 – 18,000 years old. It would not reach the surface in any appreciable amounts under natural conditions.

Available hydrologic monitoring data indicate that the springs and seeps in the southern portion of the project area are supported by snowmelt during the spring and early summer rather than by a reservoir system that would provide sustainable flows throughout the year.

Figure 2

Modification of Federal Coal Lease UTU-68082  
Surface & Groundwater Resources



- Proposed Lease Modification
- Existing Federal Coal Leases
- Stream
- Spring / Seep

- Roads
- Suitable for High Clearance Vehicles Only
  - Suitable for Passenger Cars

1:12000



### 3.2.3 Escarpment Failure

The coal lease modification area is located on the western edge of Section 32, T15S, R7E, in Huntington Canyon. The proposal is to access the coal reserves from adjacent underground mine workings. No surface occupancy is considered for the area and surface disturbance from roads or other developments would not occur.

A small outcrop of the Castlegate Sandstone, approximately 1400 feet in length (Figure 3, page 18), is located along the western edge of the proposed lease modification. Overburden thickness is approximately 800-1000 feet in this area. The escarpment is approximately 3000 feet from the only road in the area (State Highway 31). Subsidence could result in tension cracking and possible separation of blocks from the Castlegate escarpment.

#### a. Visuals

##### Characteristic Landscape

East Mountain is a long, high elevation ridge, extending North and South. Elevations range from approximately 7,000' in Huntington Canyon to over 10,700' along the ridge top. The ridge top is mostly covered with large patches of Aspen, Spruce and Fir, except for small meadows near the head of steep draws. Sagebrush extends along lower slopes and interface with the patches of conifers and aspen. Vertical ledges are common in the steep Huntington Canyon.

##### Visual Quality Objective

The Visual Quality Objective (VQO), (Manti-La Sal NF Forest Plan, *Visual Quality Objective Map, 1986*,) is Modification of landscape character in approximately the western half of the lease modification area. Under the Modification VQO, management activities may visually dominate the original landscape character, however the alterations should appear as natural occurrences within the surrounding area. In approximately the eastern half of the lease modification area the VQO is Partial Retention. Under the Partial Retention VQO, alterations may be evident, but must remain subordinate to the characteristic landscape.

#### b. Raptor Nests

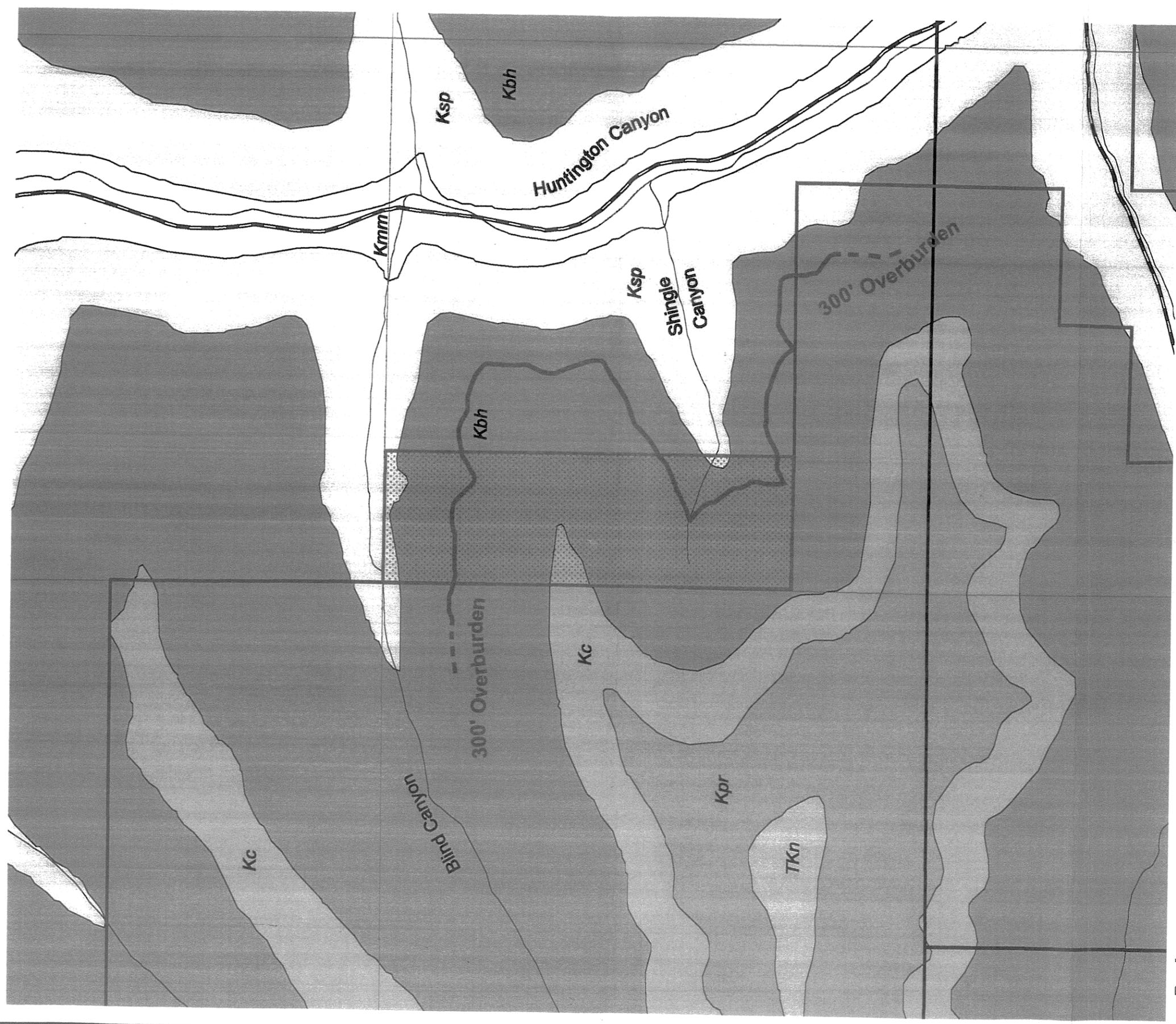
There are no known raptor nests within one mile of the proposed lease modification area boundaries.

#### c. Erosion and Sedimentation

An increase of erosion and sedimentation are sometimes associated with escarpment failure.

Figure 3

Modification of Federal Coal Lease UTU-68082  
Geology



- Roads**
- Suitable for High Clearance Vehicles Only
  - Suitable for Passenger Cars
- Geology**
- Cretaceous**
- Kpr - Price River Formation
  - Kc - Castlegate Sandstone
  - Kbh - Blackhawk Formation
  - Ksp - Start Point Formation
  - Kmm - Mancos Shale, Masuk Member
- Tertiary**
- TKn - North Horn Formation
- Proposed Lease Modification**
- Existing Federal Coal Leases

0.5 0 0.5 1 Miles

1:12000

### 3.2.4 Wildlife

#### 3.2.4.1 Threatened and Endangered Species

Endangered species are species that have been identified, and listed in the Federal Register, by the U.S. Fish and Wildlife Service (Service) as being in danger of extinction throughout all or a significant portion of its range. Threatened species are species that have been identified, and listed in the Federal Register, by the Service as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (Figure 4, page 26).

Table 3-1 lists wildlife species designated as Threatened or Endangered (T&E) by the Service that could occur in Emery County, Utah. T&E species that could occur in Emery County but do not have suitable habitat and are not likely to occur in or near the proposed project area are also identified in Table 3-1, and will not be considered further in this Wildlife Resources Report. There are no proposed wildlife species identified for Emery County.

**Table 3-1  
Threatened and Endangered Species**

A list of threatened (T) and endangered (E) species that may occur within the area of influence of the proposed Genwal lease modification project in Emery County, Utah.

SPECIES	SPECIES STATUS	SPECIES OCCURRENCE IN THE PROJECT AREA AND CONSIDERATION IN THIS WILDLIFE RESOURCES REPORT
<b>Bald Eagle</b> <i>Haliaeetus leucocephalus</i>	Threatened	<b>Not Considered.</b> There are no habitat features in or near the proposed project area that would attract bald eagles to the vicinity of the proposed project; however they may occur incidentally in or near the proposed project area. Proposed activities within the lease modification area would not impact bald eagle habitat or incidentally occurring eagles in the project area.
<b>Mexican Spotted Owl</b> <i>Strix occidentalis lucida</i>	Threatened	<b>Not Considered.</b> In Utah, the Mexican spotted owl nests in steep-walled, complex rock canyons at relatively low elevations (USDI 2001a). Canyons are generally at least 2 kilometers long and less than 2 kilometers wide. There is no suitable Mexican spotted owl habitat in or near the proposed project area.
<b>Western Yellow-billed Cuckoo</b> <i>Coccyus americanus occidentalis</i>	Candidate	<b>Not Considered.</b> The western yellow-billed cuckoo breeds in Utah, but migrates to South America during winter. Cuckoos are riparian obligates. Nesting habitat is classified as dense lowland cottonwood/willow riparian forest characterized by a dense sub-canopy or shrub layer. In Utah, nesting habitats are found at elevations between 2,500 to 6,000 feet. They appear to require large tracts (100 to 200 acres) of contiguous riparian nesting habitat (Parrish et al. 2002). There are not large contiguous tracts of riparian habitat in the vicinity of the proposed project, and the project area is located above 8,500 feet elevation. Therefore, the proposed project is not likely to affect the Yellow-billed cuckoo.
<b>Southwestern Willow Flycatcher</b> <i>Empidonax trailii extimus</i>	Endangered	<b>Not Considered.</b> The southwestern willow flycatcher is a riparian obligate, nesting in areas with high shrub densities interspersed with openings or meadows; they nest in cottonwood/willow habitats and structurally similar riparian vegetation such as alder and aspen. The proposed project is located in fairly dry pinyon/juniper, sagebrush, mohogany habitats with aspen and ponderosa pine near by; there is no suitable habitat for this species in or near the project area.
<b>Black-footed Ferret</b> <i>Mustela nigripes</i>	Endangered	<b>Not Considered.</b> The black-footed ferret depends on prairie dog colonies for food and shelter. There are no prairie dog colonies (potential ferret habitat) in or near the proposed project area. The historic range of the ferret likely included parts of Emery County, but the soils in and near the proposed project would not likely support prairie dogs or ferrets.
<b>Utah Prairie-dog</b> <i>Cynomys parvidens</i>	Threatened	<b>Not Considered.</b> Basic habitat requirements considered for the Utah prairie dog are deep, well-drained soil, vegetation low enough so that prairie dogs can see over or through, and suitable forage (Spahr et al. 1991). There is not suitable habitat in or near the proposed project area.

<b>Bonytail</b> <i>Gila elegans</i>	<b>Endangered</b>	<b>Not Considered.</b> Historically, the bonytail existed in warm water reaches of larger rivers in the Colorado River Basin; it is considered to be adapted to pools and eddies of mainstream rivers. It has been extirpated from most of its historic range. Currently, a small number of wild adults exist in Lake Mohave in the Lower Colorado River Basin, and there are small numbers of wild individuals in the Green River and in subbasins of the Upper Colorado River Basin (USDI 2002a). The bonytail has not been located on the Forest, and the proposed project would not adversely impact drainages where it is found.
<b>Humpback Chub</b> <i>Gila cypha</i>	<b>Endangered</b>	<b>Not Considered.</b> The humpback chub is restricted to deep, swift mainstem and large tributaries in relatively inaccessible canyons of the Colorado River Basin. Adults require eddies and sheltered shorelines in streams that maintain high spring flows that flush sediments from spawning areas and form gravel deposits used for spawning. Young require low-velocity shoreline habitats. Currently, there are six known extant populations, which are located in the Upper Colorado River, Yampa River and Little Colorado River (USDI 2002b). The humpback chub has not been located on the Forest, and the proposed project would not adversely impact drainages where it is found.
<b>Razorback sucker</b> <i>Xyrauchen texanus</i>	<b>Endangered</b>	<b>Not Considered.</b> Historically the razorback sucker was widely distributed in warm-water reaches of the Colorado River and its tributaries from Wyoming to Mexico. Adults require deep pools, eddies and backwaters in spring; shallow water associated with sandbars in summer; and low velocity pools and eddies in winter. Young require quiet, warm, shallow water found at tributary mouths, and in coves or shorelines in reservoirs. Currently, within the Upper Colorado River Basin this species is only found in small numbers in the middle Green River, between the confluence of the Duchesne and Yampa rivers, and in the lower reaches of those two tributaries (USDI 2002d). There are no suitable razorback sucker stream habitats on the Forest, and the proposed project would not adversely impact drainages where it is found.
<b>Colorado pikeminnow</b> <i>Ptychocheilus lucius</i>	<b>Endangered</b>	<b>Not Considered.</b> The Colorado pikeminnow is endemic to the Colorado River Basin, and it historically extended from the Green River in Wyoming, to the Gulf of California; it was widespread and abundant in warm-water rivers and tributaries. It is a long-distance migratory (hundreds of kilometers to and from spawning areas). Adults require deep pool and eddie habitats in streams that have high spring flows. Currently, in Utah this species occurs in the Green River from Lodore Canyon to the confluence of the Colorado River (USDI 2002c). The Colorado pikeminnow has not been found on the Forest, and the proposed project would not adversely impact drainages where it is found.

### 3.2.4.2 Sensitive Species

Sensitive species are species that are recognized by the Regional Forester as needing special management attention in order to prevent them from becoming threatened or endangered.

Table 3-2 lists the Intermountain Regional Forester's list of sensitive wildlife species that could occur on the Manti Division of the Manti-La Sal National Forest (MLNF). Sensitive wildlife species that do not occur or have suitable habitat in or near the proposed project area are identified in Table 3-2 and will not be considered further in this Wildlife Resources Report.

**Table 3-2**  
**Sensitive Species**

Sensitive wildlife species that could occur on the Manti Division of the MLNF, and their potential occurrence in the proposed lease modification area.

SPECIES	SPECIES OCCURRENCE IN THE PROJECT AREA AND CONSIDERATION IN THIS WILDLIFE RESOURCES REPORT
<b>Spotted Bat</b> <i>Euderma maculatum</i>	<b>Considered.</b> In Utah, the spotted bat is likely found throughout the state. It is known to use a variety of vegetation types from approximately 2,700 to 9,200 feet (Oliver 2000) , including riparian, desert shrub, spruce/fir, ponderosa pine, montane forests and meadows. Spotted bats roost alone in rock crevices high up on steep cliff faces. There are rock outcrops in the proposed lease modification area that could provide suitable roost habitat for the spotted bat.

**Townsend's Big-eared Bat**  
*Plecotus townsendii pallescens*

**Not Considered.** In Utah, Townsend's Big-eared Bats roost and hibernate in caves and mines; they also roost (but not hibernate) in buildings (Oliver 2000). There are no caves, mine openings or buildings in the lease modification area, therefore the proposed project is not likely to impact this species.

**Greater Sage Grouse**  
*Centrocercus urophasianus*

**Not Considered.** Sage grouse are generally found where there are large tracts of sage brush habitat with a diverse and substantial understory of native grasses and forbs or in areas where there is a mosaic of sagebrush, grasslands, aspen. Wet meadows, springs, seeps, or other green areas within sagebrush shrublands are generally needed for the early brood-rearing period. The proposed lease modification area is located in steep mountainous terrain with limited sagebrush habitat, which does not provide suitable habitat for sage grouse.

**Northern Goshawk**  
*Accipiter gentilis*

**Not Considered.** The proposed lease modification area is located in steep mountainous terrain that is partially covered with large tracts of young to medium aged aspen interspersed with spruce/fir and some Douglas fir, which does not provide suitable habitat for the northern goshawk.

**Peregrine Falcon**  
*Falco peregrinus*

**Not Considered.** Peregrine falcon's average foraging distance from the eyrie extends out to 10 miles, with 80 percent of peregrine falcon foraging occurring within a mile of the nest, and they have been known to forage up to 18 miles from their nest site (Spahr et al. 1991). There is a peregrine falcon eyrie located approximately 12 miles from the proposed lease modification area. Proposed activities in the lease modification area would not impact foraging peregrine falcons, their nesting habitat or their foraging habitat.

**Flammulated Owl**  
*Otis flammeollus*

**Not Considered.** Flammulated owls appear to be associated with mature pine or mixed conifer forests with a ponderosa pine and/or Douglas fir component. There are no mature mixed conifer forest stands in or near the proposed lease modification area that would provide suitable habitat for the flammulated owl.

**Three-toed woodpecker**  
*Picoides tridactylus*

**Not Considered.** Three-toed woodpeckers use forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine. Nests may be found in spruce, tamarack, pine, cedar, and aspen trees. There is no suitable three-toed woodpecker habitat in the proposed lease modification area.

**Spotted Frog**  
*Rana pretiosa*

**Not Considered.** Spotted frogs are most commonly found in cold, still, permanent water in such habitats as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, and near flat water springs with emergent vegetation. This frog has a broad distribution throughout the previously glaciated regions of British Columbia. They also occur in the Rocky Mountains of Alberta, and have patchy distribution in the United States, from Washington to Montana and south to Nevada and Utah. In Utah, the spotted frog occurs in isolated populations, and is considered to be a relict from the last ice age. The spotted frog has not been found on the Manti - La Sal National Forest or in the proposed project area.

**Colorado Cutthroat Trout**  
*Oncorhynchus clarki pleuriticus*

**Not Considered.** Colorado cutthroat trout require cool, clear water in streams with well vegetated banks, which provides cover and bank stability. Deep pools and structures such as boulders and logs provide instream cover. This species is believed to have formerly been widespread in lakes, rivers, and streams in Utah, however now it is limited to isolated headwater streams and other rigorous environments where other species such as rainbow trout and Yellowstone cutthroat trout have not been introduced. Colorado cutthroat trout are not found in the proposed project area, and the project would not adversely impact drainages where it is found.

**Bonneville Cutthroat Trout**  
*Oncorhynchus clarki utah*

**Not Considered.** Bonneville cutthroat trout require cool, clear, well-oxygenated water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning. They are found at high, moderate and low elevations in small head water streams in the Bonneville basin (USDI 2001b). Bonneville cutthroat trout are not found in the proposed project area, and the project would not adversely impact drainages where it is found.

The Genwal Resources, Inc. Lease Modification Project has the potential to impact one sensitive wildlife species: the Spotted bat.

### Spotted Bat

The spotted bat ranges from Mexico through the western states to the southern border of British Columbia; it is probably widely distributed in low numbers throughout western North America (Toone 1994). And it probably occurs throughout Utah, but its distribution appears to be patchy. Hasenyager (1980) thought that "the range of the spotted bat in Utah could incorporate the southern third of the state and central portions of the west desert where suitable roosts exist, excluding the higher portions of the central mountain range." Habitat occupied by this bat in Utah ranges from low desert (2700 ft) to montane coniferous forests below 9,200 feet in elevation (Oliver 2000). They have been found in a variety of habitat types including open ponderosa pine, desert shrub, pinyon/juniper, and open pasture and hay fields. In Utah, the spotted bat has been captured in several habitats: lowland riparian habitat (open meadows), desert shrub

communities (sagebrush/rabbitbrush), ponderosa pine forest, montane grassland (grass/aspen), and montane forest and woodland (grass/spruce/aspen). This species has also been occasionally found in or on buildings in Utah towns and cities (Oliver 2000). They typically roost singly in crevices in steep cliff faces. Cracks and crevices in limestone or sandstone cliffs provide important roosting sites (Spahr et al. 1991), especially where rocky cliffs occur in proximity to riparian areas. Day roosts and maternal roosts are typically within small (up to 6 cm) cracks and crevices in cliff faces (Toone 1994). The relative inaccessibility of cliff roosts may insulate spotted bats from human disturbance, but the species has been observed roosting (and foraging) near campgrounds (Toone 1994). Spotted bats are thought to feed mainly on moths high above the vegetation canopy. They forage alone after dark using echolocation, which is effective for fast flight feeding on tympanate moths (moths that can detect ultra-sonic sounds). As is common with many bats, spotted bats may forage a considerable distance (up to 6 miles) from roost sites (Toone 1994).

Roosting habitat in the Wasatch Plateau region is likely to occur in numerous cliffs along the edges of the plateau and on canyon walls that cut through the plateau. It is likely that spotted bats forage in a variety of habitats on the Plateau that are located within 6 miles of suitable roost cliffs and at elevations lower than 9,200 ft. Various surveys on the MLNF have detected spotted bats in several major canyons (and their tributaries) on the east side of the plateau, including Muddy, Ferron, Straight, Cottonwood, and Huntington Canyons (Perkins and Peterson 1997, and Sherwin et al. 1997).

Observations made during the 1997 surveys on the MLNF indicated that spotted bats tolerate at least moderate human disturbance while foraging. Surveys were conducted at several sites near roads with light to moderate vehicular traffic (Crandall Canyon, Huntington Canyon, Straight Canyon), including tandem coal trucks. Spotted bats were observed foraging at low elevation sites, within 30 meters of the right-of-way. The fact that spotted bats were relatively common in active and previously mined areas may imply that subsidence caused cliff failures have not dramatically affected resident populations (Sherwin, et al. 1997).

#### **3.2.4.3 Management Indicator Species**

Management Indicator Species (MIS) are species identified at the Forest planning level that could indicate changes in Forest habitats resulting from management actions. The potential impacts to these species resulting from management actions are analyzed at the project level.

Table 3-3 lists wildlife species identified as Management Indicator Species (MIS) by the Manti-La Sal National Forest (MLNF) that could occur on the Manti Division of the MLNF. MIS species that do not occur and do not have suitable habitat in or near the proposed project area are identified in Table 3-3 and will not be considered further.

### Table 3-3 Management Indicator Species

**Table 3-3. Management Indicator Species that could occur on the Manti Division of the Manti-La Sal National Forest.**

Species Common name ( <i>Scientific name</i> )	Species/Habitat Associations	Consideration of this Species
<b>Rocky Mountain Elk</b> <i>Cervus canadensis</i>	Elk tend to occupy the higher elevation aspen and mixed conifer habitats from spring through early fall, and move to lower elevation mixed shrub, pinyon/juniper, and sagebrush habitats for winter.	<b>Not Considered.</b> Elk are known to use the proposed lease modification area; however proposed activities in the area are not likely to appreciably impact this species or features of its suitable habitat.
<b>Mule Deer</b> <i>Odocoileus hemionus</i>	Mule deer use most of the habitat types surrounding the proposed project area. Lower elevation pinyon/juniper and sagebrush habitats provide suitable winter range. Most mule deer winter range is located at the edge of National Forest system lands on BLM managed land. Deer populations in this area exhibit seasonal movement (elevational migration) in response to snow cover.	<b>Not Considered.</b> Mule deer are found in and around the proposed lease modification area; however proposed activities in the area are not likely to appreciably impact this species or features of its suitable habitat.
<b>Northern Goshawk</b> <i>Accipiter gentilis</i>	Goshawks have been found in a variety of forest ecosystems including lodgepole pine, aspen, ponderosa pine, Douglas fir, and mixed forests throughout much of the northern hemisphere. Goshawk nest sites are usually located in dense mature forests with relatively large trees, near water, and on benches of relatively little slope (Graham et al. 1999). Closed canopies are important for protection and thermal cover, and relatively open understories are important to allow maneuverability during foraging.	<b>Not Considered.</b> The proposed lease modification area is located in steep mountainous terrain that is partially covered with large tracts of young to medium aged aspen interspersed with spruce/fir and some Douglas fir, which does not provide suitable habitat for the northern goshawk.
<b>Golden Eagle</b> <i>Aquila chrysaetos</i>	Golden eagles generally inhabit mountainous or hilly terrain, but can also be found in valleys and western plains, especially during migration and winter. They generally nest on cliffs, but they also have been known to nest in trees. They hunt over open country for small mammals, snakes, birds and carrion.	<b>Not Considered.</b> There is potentially suitable golden eagle nesting habitat near the proposed lease modification area, and there is suitable golden eagle foraging habitat in and near the proposed project area; however proposed activities in the area are not likely to appreciably impact this species or its preferred habitat.
<b>Macroinvertebrates</b> (aquatic Insects)	Aquatic macroinvertebrates play important roles in ecosystems where they occur. Their best known role is serving as food for other organisms, especially fish, amphibians, and water birds. They are also important in other ecological processes such as the breakdown and cycling of organic matter and nutrients.	<b>Considered.</b> Aquatic macroinvertebrates occur in streams near the proposed lease modification area. Macroinvertebrates were found in streams near the proposed lease modification area.

#### Macroinvertebrates (Aquatic)

A variety of aquatic macroinvertebrate species (Collins, Patrick D., Perennial Stream considerations at "No-Name Creek" & Blind Canyon Creek, Tributaries to Huntington Canyon Creek, June, 2004) that require a continuous water source inhabit Blind Canyon Creek, which flows near the northern end of the proposed lease modification area. A number of macroinvertebrates that do not require year-round flows were found in the lower reach of Shingle Canyon Creek, which is east of the lease modification area.

Changes in aquatic macroinvertebrate populations have been linked to changes in aquatic habitat condition due to land management actions. Aquatic macroinvertebrate population changes have been attributed to high spring runoff, to high summer water flows, to low stream flows, increased sedimentation and changes in water chemistry.

### 3.2.4.4 Migratory Birds

Migratory bird conventions impose obligations on federal agencies for the conservation of migratory birds and their habitats. The Migratory Bird Treaty Act has implemented these conventions with respect to the United States, and Executive Order 13186 ensures that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions on migratory birds, with emphasis on species of concern.

The Utah Partners in Flight Avian Conservation Strategy identifies 20 non-game migratory land birds as priority species. Eleven of these species could be expected to occur on the Ferron/Price Ranger District of the Manti-La Sal National Forest. Table 3-4 lists these species, their habitat associations, and their consideration in the document.

**Table 3-4**  
**Neotropical Migratory Birds**

**Table 3-4. Neotropical migratory birds (NTMBs) listed as priority species by the Utah Partners in Flight Avian Conservation Strategy that could occur on the Manti Division of the Manti-La Sal National Forest.**

Common name ( <i>Scientific name</i> )	Species/Habitat Associations	Consideration of this species
<b>Virginia's Warbler</b> ( <i>Vermivora virginiae</i> )	Preferred breeding habitat includes chaparral and open stands of pinyon/juniper, ponderosa pine and scrub oak, mountain mahogany thickets or other low brushy habitats on dry mountainsides. In Utah, the primary breeding habitat is oak, and secondary breeding habitat is pinyon/juniper at elevations ranging from 4,000 to 10,000 ft. (Parrish et al. 2002).	<b>Not Considered.</b> Virginia's warblers are known to occur on the Ferron/Price Ranger District of the Manti-La Sal NF, but they are not known to nest here, and there is no suitable breeding habitat in the proposed lease modification area.
<b>Gray Vireo</b> ( <i>Vireo vicinior</i> )	Preferred breeding habitat is on arid slopes dominated by mature pinyon/juniper woodlands. This species commonly occurs in suitable habitats in Colorado, Nevada and Arizona at elevations ranging from 3200 ft. to 6800 ft., and they are known to nest in southwest Utah north to Sevier County. Gray vireos are not believed to nest on the Manti Division of the Manti-La Sal NF, but occur at lower elevations in Emery County, Utah (Parrish et al. 2002).	<b>Not Considered.</b> The proposed lease modification area does not provide suitable habitat for this species, and the project area is located above 8,000 ft. elevation, which is above the elevation range of this species.
<b>Bell's Vireo</b> ( <i>Vireo bellii arizonae</i> )	Preferred nesting habitat in Utah is cottonwood-willow dominated riparian areas. This species breeds in southwestern Utah in the Virgin River drainage, Zion NP, and Beaver Dam Wash (Parrish et al. 2002). Bell's vireos are not known to nest on the Manti Division of the Manti-La Sal NF.	<b>Not Considered.</b> The proposed project area does not contain suitable riparian habitat for this species.
<b>Black Rosy-Finch</b> ( <i>Leucosticte atrata</i> )	Breeds above timberline in Alpine tundra using barren, rocky or grassy areas and cliffs among glaciers or at bases of snow fields. In Utah, the largest breeding populations occur in alpine habitats in the Wasatch and Uinta Mountains.	<b>Not Considered.</b> The proposed project is located in sub-alpine habitats below the elevation breeding range of the black-rosy finch.

**Brewer's Sparrow**  
(*Spizella breweri breweri*)

Breeding habitat is primarily shrubsteppe, but may also breed in high desert scrub (greasewood) habitats. Breeding habitats are usually dominated by big sagebrush (Parrish et al. 2002).

**Not Considered.** There is some potentially suitable breeding habitat within the proposed lease modification area; however proposed activities in this area are not likely to appreciably impact the Brewer's sparrow.

**Black Swift**  
(*Cypseloides niger*)

Black swifts nest in small colonies near and often behind waterfalls at elevations ranging from 6,000 ft. to 11,500 ft (Parrish et al. 2002). There are only 2 confirmed breeding locations Utah: the Bridal Veil Falls area and Aspen Grove area (Parrish et al. 2002)

**Not Considered.** The proposed project area does not contain suitable nesting habitat for this species.

**Broad-tailed Hummingbird**  
(*Selasphorus platycercus*)

In Utah, the primary breeding habitat is lowland riparian; They have also been recorded as breeding in mountain riparian, aspen, ponderosa pine, Engelmann spruce, subalpine fir, and Douglas fir (Parrish et al. 2002). Nesting typically occurs at elevations ranging from 6,000 to 8,000 ft. near streamside habitat.

**Not Considered.** The broad-tailed hummingbird may occur in the proposed lease modification area; however proposed activities in the area are not likely to appreciably impact this species.

**Ferruginous Hawk**  
(*Buteo regalis*)

Usually breeds in areas of flat and rolling terrain in grassland or shrub steppe habitat. Avoids high elevations, forest and narrow canyons. Occurs in grasslands, agricultural lands, sagebrush/saltbrush/greasewood shrub lands and the periphery of pinyon/juniper habitats.

**Not Considered.** The proposed lease modification area is located at high elevations and in steep terrain, which does not provide suitable habitat for the ferruginous hawk.

**Yellow-billed Cuckoo**  
(*Coccyzus americanus*)

In Utah, the yellow-billed cuckoo is a rare breeder in large tracts (100-200 acres) of contiguous dense lowland riparian habitats. Over the last 10 years, there are only 3 breeding records in the state; none on the Manti Division of the Manti-La Sal NF (Parrish et al. 2002).

**Not Considered.** There are no large tracts of riparian habitat in or near the proposed lease modification area; the project does not provide suitable habitat for the yellow-billed cuckoo.

**Black-throated Gray Warbler**  
(*Dendroica nigrescens*)

Preferred breeding habitat includes dry oak slopes, pinyon, juniper, pinyon/juniper woodlands, open mixed woods, and dry coniferous and mixed conifer habitats with brushy understories, and in chaparral. It occurs from sea level up to 5400 ft. elevation.

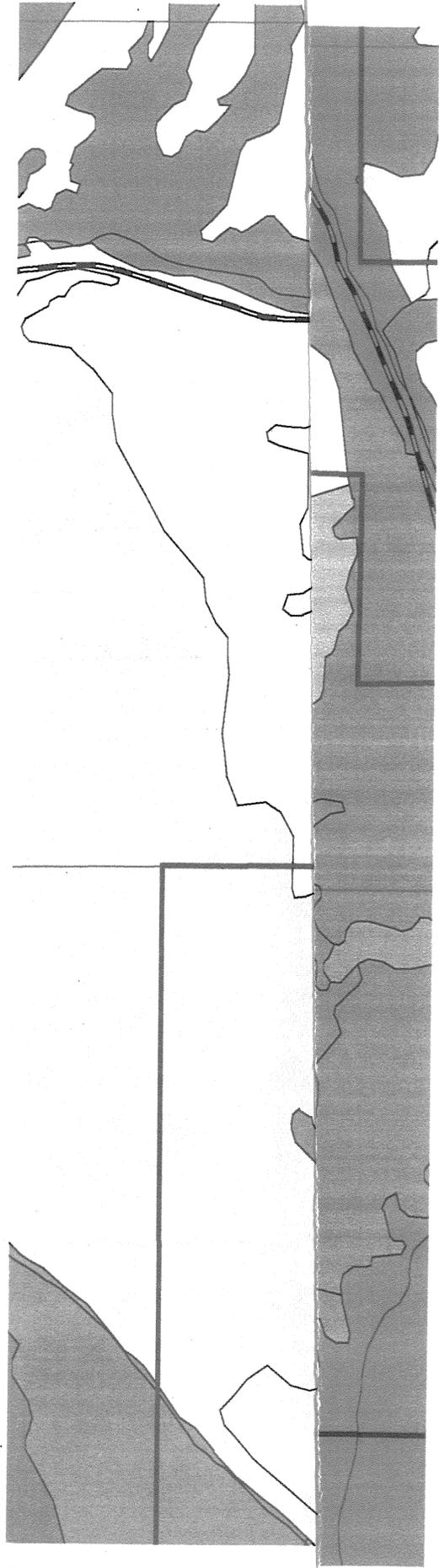
**Not Considered.** The proposed project is located above 8,000 feet elevation, which is above the elevation range of the black-throated gray warbler.

**Sage Sparrow**  
(*Amphispiza belli nevadensis*)

Uncommon permanent resident in Utah; occurs up to 8,000 ft. elevation. Nests have been found in rabbitbrush, hopsage, saltbush, and big sage.

**Not Considered.** There is some potentially suitable breeding habitat within the proposed lease modification area; however proposed activities in this area are not likely to appreciably impact the sage sparrow.

**Figure 4**  
**Modification of Federal Coal Lease UTU-68082**  
**Habitat**



- Roads**
- Suitable for High Clearance Vehicles Only
  - Suitable for Passenger Cars
- Vegetation**
- Grass Land
  - Wetland
  - Forb Land
  - Sagebrush
  - Mountain Brush
  - Mixed Conifer
  - Desert Shrubland
  - Aspen
  - Aspen/Mixed Conifer
  - Pinyon and/or Juniper
  - Rock
- Proposed Lease Modification**
- Proposed Lease Modification
  - Existing Federal Coal Leases

1:12000



### **3.3 DESCRIPTION OF OTHER RESOURCES**

#### **3.3.1 Range and Noxious Weeds**

The lease modification area lies on the allotment boundary between the Gentry Mountain cattle allotment and the Crandall Ridge sheep allotment. This is a very steep area with rock outcrops and is not considered suitable for grazing by either sheep or cattle. The area is mostly mapped as unsuitable aspen. No conflicts are anticipated with the lease proposal as far as impacts to available livestock forage.

The closest livestock watering troughs are approximately 2500 feet to the southwest of the project area. This area has been previously undermined without reported damage to the troughs. In the project area itself, there are four springs that provide water for sheep while they graze the upper ridges. Cattle water in the bottom of the canyon along Huntington Creek and no impacts to available water are anticipated in this area.

#### Crandall Ridge Sheep Allotment

Presently, this allotment is being combined with the Crandall Canyon Sheep Allotment but the combination of these two allotments has not been finalized at this time. The permitted number of sheep is expected to be 900 head with a July 1 to September 30 grazing season. There are 3 sheep permittees dependent on this allotment for summer forage.

#### Gentry Mountain Cattle Allotment

The allotment provides forage for 1440 head of cattle with a June 27 to September 30 grazing season. Fifteen livestock permittees, mostly from Huntington, Utah, graze their cattle within the permitted area. Approximately 400 head enter the allotment through Huntington Canyon (west side of allotment), others enter through Mohrland (east side of Gentry Mountain). Those that use Huntington Canyon graze up side canyons and along Huntington Creek to Pole Canyon where the cows are moved to the top of Gentry Mountain. Steep side slopes in the canyon keep cattle in the bottoms and rarely do they get to the top of East Mountain.

#### Noxious Weeds

Musk thistle is well established in side canyons in Huntington Canyon. Any surface disturbance of the lease area would most likely be invaded by musk thistle unless aggressive control action is initiated. The status of weeds within the lease area is not known but canyons on either side of the new lease (Blind and Crandall Canyons) have established stands of musk thistle. Biological control agents have been placed throughout Huntington Canyon but establishment of viable populations of those insects has been spotty.

No roads or portal facilities would be constructed for this project and, therefore, noxious weed introduction should not occur.

### **3.3.2 Paleontological and Cultural Resources**

#### Paleontology

The area between Crandall Canyon and Blind Canyon was reviewed on Forest Service Paleontological Inventory Maps. There are no known paleontological resources in the area and very few rock outcrops within the area that lend it to meaningful fossil surveys. Therefore, there is presently no concern that the coal lease modification project would impact any resources in paleontology.

#### Archaeological Resources

The area was surveyed for potential historic or archaeological resources in June 2004. None were found and the potential effects have been determined to be negligible. A letter received from the Utah State Historic Preservation Office states that no historic properties would be affected in the area.

Should any unanticipated paleontological or cultural resources be encountered during the implementation of this project, all work would stop until assessment of the finding could be made.

### **3.3.3 Roadless Area**

The proposed coal lease modification lies within the East Mountain Roadless Area. The undeveloped character of the roadless area would not be affected. No roads or portal facilities would be constructed for this project. The proposed lease modification is an isolated area adjacent to the current lease; it contains a small amount of mineable coal accessible only through the current lease. The proposed action would not lead to other future mining actions. The coal lease modification would be mined entirely by underground mining methods and adjacent existing underground mine workings would access the tract. The amount of subsidence would be minimal, approximately 3 feet.

## **CHAPTER 4 ENVIRONMENTAL CONSEQUENCES**

### **4.1 INTRODUCTION**

This chapter identifies the projected impacts of implementing each of the alternatives considered in detail in Chapter 2. This chapter discloses the potential direct/indirect effects, cumulative impacts, and irreversible and irretrievable commitments for the Issues Evaluated in Detail. The criteria for significant impacts refer to adverse impacts to the quality or quantity of perennial streams, intermittent stream segments tributary to perennial streams, reservoirs, wetlands, and surface water rights. Insignificant impacts are those related to ephemeral drainages, intermittent streams, and ponds. Direct and indirect effects are those effects that would likely occur during or shortly after implementation of a specific alternative. Direct/indirect effects are presented by resource topic corresponding to the issues identified in Chapter 1. Cumulative impacts are those effects that may occur with implementation of an alternative combined with other past, present, or reasonably foreseeable actions. Activities on East Mountain that could add incrementally to the impacts of the proposed lease modification are included in Appendix A. An irreversible commitment of resources generally applies to non-renewable resources; however, it could also apply to actions that can only be renewed after a very long period of time. Irretrievable commitments apply to losses of production or commitment of renewable natural resources; the loss is only irretrievable for the period of time during which the disruption to the resource is taking place.

**Table 4-1, List of Alternatives**

<b>Alternative 1 - No Action</b>
<b>Alternative 2 - Consent/Approval of Project as Proposed</b>
<b>Alternative 3 - Approval of the Project with Supplemental FS Mitigations</b>

### **4.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE IMPLEMENTATION**

#### **4.2.1 Surface Water**

##### **Alternative 1 - No Action**

##### **Direct and Indirect Effects**

No change from those described in Chapter 3.

## **Cumulative Impacts**

No change from the existing condition.

## **Irreversible and Irretrievable Commitment of Resources**

None.

## **Alternative 2 - Approval of the Lease Modification as Proposed**

### **Direct and Indirect Effects**

Full extraction mining could cause fractures to extend from the mine to the surface where overburden (Figure 2, page 15) is less than approximately 50 times the height of the extracted coal (Peng, BLM communication November 2004). The maximum depth that tension fractures extend below the surface is approximately 50 feet (Maleki, FS communication November 2004). Based on these data, the overburden necessary to prevent fracturing that could extend from the surface to the mine workings would be 50 times the thickness of the coal plus 50 feet. Figure 2 depicts a 300 foot overburden contour for a 5 foot seam (5 feet of coal x 50 plus 50 feet = 300 feet). These fractures could divert water (which would normally flow down the drainages) from the surface into the mine workings. The result would be a decrease in flow with associated impacts to drainages. The fractures would tend to heal within a few years by a combination of sloughing of sediments into the fractures and swelling of the clays. The loss of water could impact the riparian habitat around the springs, along the drainages, and the stock watering rights held by the FS.

## **Cumulative Impacts**

The impacts to surface water may add incrementally to the impacts to surface water by other past, present, and future mining activities in Huntington Canyon. Subsidence and surface cracking may result in alteration of surface and subsurface water flow paths, ultimately affecting the springs and seeps supplying water to the drainages.

Huntington Creek is currently experiencing reduced flows due to long term drought conditions and limited releases from Electric Lake.

## **Irreversible and Irretrievable Commitment of Resources**

Crandall Canyon Mine seldom has a need to discharge water to Crandall Canyon Creek. Most of the water seeping into the mine is utilized as process water. Therefore, surface water diverted to the mine might not be discharged back into the Huntington Creek watershed through the mine portal in Crandall Canyon. The water would be irretrievably lost as far as its use in supporting the riparian system and stock watering along Shingle Canyon Creek and Blind Canyon.

## **Alternative 3 - Approval of the Lease Modification with Supplemental Mitigations**

### **Direct and Indirect Effects**

Not allowing surface subsidence in areas with insufficient overburden would limit fractures from connecting the surface with the mine workings, and thus would prevent water from being diverted into the mine. The surface water would be kept on the surface to support the riparian systems and stock watering rights in the drainages. There would be no direct or indirect effects to surface water resources.

### **Cumulative Effects**

Mining in the area of the lease modification would not increase cumulative impacts to the surface water resources of the Huntington Creek drainages. Impacts of other mining activities in the area would continue.

### **Irreversible and Irretrievable Commitment of Resources**

None.

## **4.2.2 Ground Water**

### **Alternative 1 - No Action**

#### **Direct and Indirect Effects**

No change from those described in Chapter 3.

#### **Cumulative Impacts**

No change from the existing condition.

#### **Irreversible and Irretrievable Commitment of Resources**

None.

### **Alternative 2 - Approval of the Lease Modification as Proposed**

#### **Direct and Indirect Effects**

Surface subsidence effects could affect flow patterns to existing springs and seeps that are located in areas with insufficient overburden. Several springs and seeps (Figure 2, page 15) are located in areas with insufficient overburden (5 ft coal seam thickness x 50 plus 50 feet = 300 feet). With insufficient overburden, subsidence cracks could reach from the mine to the ground surface, providing a direct hydraulic connection. Surface water (interflow, through flow, and sheet flow) and groundwater (springs and seeps)

would be intercepted by the mine workings in this case, depriving the drainage of the water it would normally receive. Riparian areas are probably associated with each of these springs/seeps. Loss of this water could affect the production of forage available for cattle, sheep, and wildlife, resulting in a reduction in the cattle and sheep allotments and in a change of wildlife habitat.

### **Cumulative Impacts**

The past, present or reasonably foreseeable future actions that may add incrementally to impacts to the ground water resources of the area are mining activities within:

- 1) Mill Fork Coal Tract (Deer Creek Mine, Energy West Mining Company).
- 2) South Crandall Revision (Crandall Canyon Mine, Genwal Mining Company).
- 3) Crandall Canyon Mine.

Subsidence and surface cracking from underground coal mines in the area may result in alteration of flow paths to springs and seeps with potential loss of water.

### **Irreversible and Irretrievable Commitment of Resources**

If a sufficient overburden were not maintained, there would be an irreversible loss of ground water captured by the mine. The amount of water lost to the mine would be irretrievable.

### **Alternative 3 - Approval of the Lease Modification with Supplemental Mitigations**

#### **Direct and Indirect Effects**

Requiring an overburden of 50 times the coal seam thickness plus 50 feet would limit the possibility of subsidence cracking providing a direct hydraulic connection between the mine and surface. In this case, the mine would not capture surface runoff and alluvial ground water flow and there would be no direct or indirect effects to ground water resources in the proposed lease modification.

#### **Cumulative Impacts**

Cumulative impacts to ground water resources would not be expected under this alternative.

#### **Irreversible and Irretrievable Commitment of Resources**

None.

### **4.2.3 Escarpment Failure**

#### **Alternative 1 - No Action**

##### **Direct and Indirect Effects**

No change from those described in Chapter 3.

##### **Cumulative Impacts**

No change from the existing condition.

##### **Irreversible and Irretrievable Commitment of Resources**

None.

#### **Alternative 2 - Approval of the Lease Modification as Proposed**

##### **Direct and Indirect Effects**

The estimated surface subsidence is approximately 3 ½ feet, based upon a 5 feet coal seam thickness. Approximately 1400 feet of the Castlegate sandstone escarpment is susceptible to subsidence (Figure 3, page 17). Subsidence could result in tension racking and the possible separation of blocks from the escarpment. The small size of the escarpment, its remoteness, the fact that no man-made structures are present in the lease modification area, and its distance from the nearest road all tend to mitigate the effects of undermining the escarpment.

The projected amount of subsidence in ledges associated with this project would not be expected to create apparent visual changes. The subsidence in ledges would appear as natural occurrences and blend with existing ledge features. This result is consistent with the Visual Quality Objectives of Modification and Partial Retention for the area.

There are no raptor nests located within or near the tract; therefore there would be no direct or indirect effects to raptors.

Erosion would be slightly increased over natural conditions. However, this would not lead to a substantial increase in sedimentation received by any of the drainages within or near the tract.

##### **Cumulative Impacts**

None.

**Irreversible and Irretrievable Commitment of Resources**

None.

**Alternative 3 - Approval of the Lease Modification with Supplemental Mitigations**

**Direct and Indirect Effects**

Same as Alternative 2.

**Cumulative Impacts**

Same as Alternative 2.

**Irreversible and Irretrievable Commitment of Resources**

Same as Alternative 2.

**4.2.4 Wildlife**

**Alternative 1 - No Action**

**Direct and Indirect Effects**

No change from those described in Chapter 3.

**Cumulative Impacts**

No change from the existing condition.

**Irreversible and Irretrievable Commitment of Resources**

None.

**Alternative 2 - Consent/Approval of the Lease modification as Proposed**

**Direct and Indirect Effects**

The proposed lease modification would not likely directly or indirectly impact any threatened, endangered, proposed or candidate wildlife species or their preferred or critical habitat (Figure 4, page 26). However one sensitive wildlife species, the spotted bat, could potentially be impacted.

Spotted bats are known to occur in Huntington Canyon, which is located just east of the proposed lease modification area. Rock outcrops in the project area may provide

marginally suitable roost habitat; however since there is an abundance of cliff faces more suitable for roosting throughout Huntington Canyon and its tributaries, roosting in the project area is not expected to be common. Therefore, there is not likely to be appreciable direct or indirect affects to roosting spotted bats or roosting habitat.

Spotted bats may forage in the proposed lease modification area; however proposed activities in the project area would not alter foraging habitat and the project would not likely directly or indirectly impact foraging spotted bats.

Macroinvertebrates could be impacted by a loss of water in Shingle Canyon Creek under this alternative. Without an adequate overburden thickness, the mine could intercept water that would normally enter the drainage.

### **Cumulative Impacts**

Under this alternative, there would be cumulative impacts to the macroinvertebrate population downstream of the lease modification area. The drainage would be deprived of the water that the macroinvertebrates require to survive.

### **Irreversible and Irretrievable Commitment of Resources**

An irreversible commitment of resources would be associated with the loss of habitat supporting the macroinvertebrate population.

The loss of habitat supporting the macroinvertebrate population would be an irretrievable commitment for the time that surface water is intercepted by the mine.

### **Alternative 3 - Approval of the Lease Modification with Supplemental Mitigations**

#### **Direct and Indirect Effects**

Under this alternative, an adequate overburden thickness would be maintained, flows would remain intact and effects to the macroinvertebrate population would be mitigated.

#### **Cumulative Impacts**

Since the proposed lease modification area would not appreciably directly or indirectly affect aquatic macroinvertebrates, there would be no cumulative impacts as a result of the proposed project.

#### **Irreversible and Irretrievable Commitment of Resources**

Under this alternative, there would be no irreversible or irretrievable commitment of resources.

## CHAPTER 5 COMMENTS AND RESPONSES

### 5.1 INTRODUCTION

This chapter presents the comment letters received by the Forest Service in response to public scoping and the Forest Service responses to those comment letters. Four letters were received and each one was assigned a number based upon the order in which it arrived. The letters are presented in their entirety in Section 5.3, following the responses. A bracket in the left column identifies individual comments in each letter; the number accompanying the bracket keys the comment to the appropriate response.

The 4 letters received are listed below:

<u>Letter Number</u>	<u>Letter Date</u>	<u>Affiliation</u>
1	June 2, 2004	Utah Environmental Congress
2	June 3, 2004	The Hopi Tribe
3	July 8, 2004	U.S. Fish and Wildlife Service
4	July 13, 2004	The Navajo Nation

### 5.2 RESPONSES

The responses to comments are presented below in the order the letters were received.

#### **Comment Letter 1 Utah Environmental Congress**

Comment 1.1:

“The Legal Notice of opportunity to comment on the Proposed Action states that an ‘Environmental Analysis’ will be conducted”.

“Coal lease modifications may not be Categorical Excluded from NEPA because they trigger the environmental assessment/environmental impact statement process”.

“Is the Forest actually intending to CE the proposed coal lease modification?”

FS Response:

The Forest Service and the BLM will prepare an Environmental Analysis for this project.

Comment 1.2:

“The Legal Notice of Proposed Action does not provide an adequate description of the Proposed Action. All that exists is a general township and range description of the area

of concern (in Township 16 South, Range 7 East, SLM) and a statement that a coal lease modification is proposed in that location”.

FS Response:

The original legal notice (published on May 4, 2004) incorrectly stated that the lease modification was located in Township 16 South. It was republished on June 8, 2004 to correctly state Township 15 South. However, the public scoping letters that were sent out to 77 recipients (including UEC) on May 10, 2004 correctly stated that the lease was located in Township 15 South.

Both the revised legal notice and public scoping letter adequately describe the location of the proposed coal lease modification and the purpose of adding the 120 acre tract to the existing lease.

Comment 1.3:

“There is no description of any restrictions, allowances, stipulations or mitigation that may or may not be associated with the proposed action”.

FS Response:

It is Forest Service policy to develop stipulations and mitigations during the NEPA process; therefore, the Forest Service does not identify mitigations at the time of scoping.

Comment 1.4:

“The UEC is concerned that the Proposed Action described in the Legal Notice of Opportunity to Comment on the Proposed action may be part of a larger action or plan but is being analyzed separately in a manner that is not consistent with NEPA”.

“Located immediately south of Rilda Canyon, this Proposed Action appears to be an interdependent part of a larger action or plan to expand a coal mine further under the southern end of the East Mountain roadless area”.

“Accordingly, these analyses should be combined into one NEPA analysis, and not inappropriately compartmentalized”.

FS Response:

As explained under the response to Comment 2, the proposed lease modification area is in Township 15; approximately 5 miles north of the proposed Rilda Canyon portal facilities. The coal reserves in the proposed 120 acre lease modification would be approached from existing underground mine workings in the Crandall Canyon Mine. No roads or portal facilities would be constructed for this project. The proposed lease modification area is an isolated area adjacent to the current lease; it contains only a small amount of mineable coal accessible only through the current lease. The proposed action would not lead to other future mining actions. The maximum modification for any lease is 160 acres. That puts a limit on how much acreage could be added as a lease modification without issuing a new lease.

Comment 1.5:

“Furthermore, we are concerned that many of the current and proposed oil, gas and coal projects on the Wasatch Plateau have cumulative impacts that were not included or anticipated in the scope of the 1986 Manti-La Sal Forest Plan FEIS, or the 1992-1994 amendments that dealt solely with oil/gas cumulative effects and NOT the cumulative effects of subsidence coal mining”.

FS Response:

Cumulative impacts, including associated subsidence related impacts, for coal areas were addressed in the 1986 Manti-La Sal Forest Plan FEIS. Cumulative effects for oil and gas projects were addressed in the 1992 Oil and Gas FEIS, in the EA completed for the original lease to be readjusted, and in the EA for the adjacent Mill Fork Tract (currently leased as State Coal Lease ML 48258).

Comment 1.6:

“Because of the adverse, long term cumulative effects to forest resources that have not been adequately disclosed or analyzed, we urge the Forest to develop a new programmatic EIS or SEIS that would disclose, discuss, and analyze the significant cumulative impacts to the watershed, Threatened, Endangered species (including Threatened and Endangered fish who may be adversely impacted downstream off of the Forest), as well as Proposed (ESA), FS Sensitive species”.

FS Response:

The Forest Plan is currently under revision. The associated environmental analysis will include a cumulative effects analysis, as appropriate, including an assessment of effects to Threatened, Endangered, and Sensitive species.

Comment 1.7:

“Cumulative effects to wolverine have never been disclosed or analyzed, and need to be with this analysis”.

FS Response

The Utah Division of Wildlife Resources (DWR) has stated that “the species was probably never common in Utah...” and that “Wolverines prefer alpine tundra and mountain forests that are not frequented by humans.” Sightings have been reported in parts of Utah, but not near the project area. DWR has recently mapped potential wolverine habitat, which includes the lease modification area. However, underground coal mining within the lease modification area would not impact possible wolverine habitat on the Forest.

Comment 1.8:

“We are also concerned that the irretrievable and irreversible commitments of roadless and wilderness resources have not been disclosed or properly analyzed for this region”.

FS Response:

No roads or surface facilities are anticipated for this project; there would be no effects to

the roadless character caused by the project.

Comment 1.9:

“Perhaps most importantly, there needs to be a rigorous analysis of the cumulative effects to the watersheds originating on the Wasatch Plateau from the extensive oil, gas, AND coal mining. Most, if not all perennial streams, reservoirs, and springs in this part of the Wasatch Plateau have been affected by the cumulative impacts of oil, gas and coal mining, but there has never been an adequate analysis of the cumulative effects”.

FS Response:

As noted in the response to Comment 5, cumulative effects for coal areas were addressed in the 1986 Forest Plan FEIS; additionally, cumulative effects for oil and gas development were addressed in the 1992 Oil and Gas FEIS.

Comment 1.10:

“The Migratory Bird Treaty Act (MBTA) makes it unlawful to take, kill, or possess migratory bird resources, which includes individuals, their young, their parts, nests, or eggs”.

“To help meet responsibilities under Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), the UEC recommends that you conduct activities outside critical breeding seasons for migratory birds, minimize temporary and long-term habitat losses, and mitigate all unavoidable habitat losses”.

FS Response:

As described previously, no surface facilities or roads are anticipated for this project. The coal lease modification would be mined entirely by underground mining methods and adjacent existing underground mine workings would access the tract. The amount of subsidence would be minimal and it is not anticipated that migratory birds would suffer adverse effects.

Comment 1.11:

“Consultation with U.S. Fish and Wildlife Service should be conducted for the Mexican Spotted Owl (MSO) and Lynx since this area may contain suitable habitat for both listed species, and this is close to the only recent, confirmed lynx in Utah. Population and habitat surveying for MSO should be conducted throughout the project area and cumulative effects analysis area(s) (which are not disclosed in the Scoping Notice), focusing on cliffs, rock outcroppings, and other escarpments, which may contain MSO or their habitat”.

“The Township and Range description provided identifying the Proposed Action is very close to at least one confirmed active Golden eagle nest that needs to be closely monitored and appropriate mitigation measures need to be provided in the Proposed Action.

FS Response:

The land surface elevation in the proposed lease modification area is above potential MSO habitat. There is no suitable MSO or lynx habitat in the proposed lease modification area. Consultation with the U.S. Fish and Wildlife Service will take place as appropriate based on conclusions of the Biological Evaluation/Biological Assessment and agreements between the agencies. The selected alternative will provide for monitoring and protection of wildlife determined necessary.

There are no raptor nests in or near the proposed lease modification area that could potentially be affected by subsidence.

Comment 1.12:

“Mule deer, Rocky mountain elk, macroinvertebrates (BCI), goshawk, three toed woodpecker are MIS that should be central issues with the proposed subsidence mining”.

“Specifically, any site-specific analysis must address the impacts of development to MIS, MIS populations, as well as MIS habitat”.

FS Response:

An impact analysis for MIS species will be provided in the EA and/or supporting documents for the proposed lease modification. The Three-toed woodpecker is not an MIS for the Manti-La Sal N.F.

Comment 1.13:

“Subsidence of the surface may disrupt the soils, hydrology and physiological integrity of the plants that comprise the mixed conifer forest on the surface, making the forest more susceptible to insect and disease. Stressed and insect-infested coniferous forests may or may not present greater risk of wildfire (in terms of ignitability and intensity of burn)”.

FS Response:

The vegetative cover on the proposed coal lease modification is not mixed aspen-conifer. Aspen Plant Community covers 86 of the 120 acres; grass and Big Mountain Sagebrush cover the remaining 34 acres. The effects of subsidence have been evaluated in the EA and mitigations developed as necessary to minimize effects to meet Forest Plan direction for the area.

## **Comment Letter 2 The Hopi Tribe**

Comment 2.1:

“As you know, the Hopi Cultural Preservation Office supports the identification and avoidance of prehistoric archaeological sites and Traditional Cultural Properties. Therefore, to assist us in determining if the area of potential effect for this proposal contains cultural resources significant to the Hopi Tribe, please provide us with a copy of the cultural resource survey report of the project area for review and comment”.

FS Response:

The cultural resource survey report for the project has been submitted to the Hopi Cultural Preservation Office.

### **Comment Letter 3**

#### **U.S. Fish and Wildlife Service**

Comment 3.1:

“During a conversation between Diana Whittington of our office and Karl Boyer from the Forest (June 24, 2004), we learned that the area under consideration for mining in this current lease addition presents conditions that may lead to loss of perennial surface water from mining subsidence”.

FS Response:

Mr. Erik Petersen performed a hydrologic investigation of the proposed coal lease modification area. Two visits were performed during May and June 2004. A hydrologic report based on the findings was submitted to the Forest Service in late June. On the first visit, all of the springs and seeps that had been identified in the study area during past surveys were monitored for discharge and water quality. The drainage in the southern portion of the study area, referred to as No-Name Canyon, was also monitored for discharge and water quality on both visits. Recent and historical data indicate that the springs and seeps are not supported by a deep-seated reservoir capable of sustaining flow throughout the year. Rather, they are supported by snowmelt during the spring and early summer. The flows recorded in No-Name Canyon also reflect these findings. The basic conclusion of the report was that No-Name Canyon is not perennial.

Mr. Patrick Collins performed a field investigation of the same area in May and June 2004. Mr. Collins' investigation relied mainly on biological resource indicators. Relative comparisons of stream flows were also made on the three visits to the area; actual discharges were not recorded. Macroinvertebrate species in No-Name Canyon indicate that it is not perennial. However, certain plant species found in the drainage leave open the possibility that the stream could be given a perennial designation. Mr. Collins stated that it is possible that No-Name Canyon could be intermittent in the upper reaches and perennial in the lower reaches. Mr. Collins also stated that the only method to make a conclusive determination regarding perennial status was to conduct another survey of the area later in the growing season. With regard to Blind Canyon, Mr. Collins stated that a perennial designation could be assigned to that drainage with much more confidence at this time.

Comment 3.2:

“In general, areas with shallow overburden will be more prone to surface cracks from subsidence, and thus more prone to loss of surface water. Also, given the close proximity of the coal seam to the surface, there may be an increased risk to wildlife from contamination of water that seeps through the subsidence cracks and then resurfaces quickly”.

FS Response:

Approximately 25% of the proposed coal lease modification has 300 feet or less of overburden. The two areas of concern are in the northern and southeastern portions of the lease modification. Many of the springs and seeps are located in the southeastern area. Studies and experience have shown that an overburden equal to 50 times the coal seam thickness plus 50 feet is required to prevent structural cracking reaching from the mine to the ground surface. Since the coal seam thickness is expected to be approximately 5 feet, the overburden required is 300 feet. If less overburden is present a direct connection (through ground cracking) to the surface would be established, resulting in the capture by the mine of surface runoff, interflow, and throughflow. In order to prevent this, the FS has required a stipulation that will limit full extraction mining to areas with overburden equal to 50 times the coal thickness plus 50 feet.

Comment 3.3:

“These aspen stands are in the immediate vicinity of the springs and seeps that might be affected by mining subsidence. Loss of these springs and seeps may result in loss of the aspen stands, a primary breeding habitat for a Service Bird of Conservation Concern, the red-naped sapsucker. In addition, aspen stands provide high-value habitat for big game species such as elk and mule deer”.

“In light of the aforementioned value of perennial surface waters to fish and wildlife resources, we recommend that any mining permitted be limited to mining for non-subsidence in areas where loss of springs or seeps may occur”.

FS response:

Mining subsidence, in itself, might not result in the loss of the seeps and springs as long as sufficient overburden is present to prevent a direct connection between the mine and ground surface. Additionally, aspen stands are not linked to springs and seeps.

Comment 3.4:

“Federal agencies have specific additional responsibilities under Section 7 of the ESA. To help fulfill these responsibilities, we are providing an updated list of threatened (T) and endangered (E) species that may occur within the area of influence of your proposed action”.

“The proposed action should be reviewed and a determination made if the action will affect any species or their critical habitat. If it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is complete, and no further action is necessary”.

“Formal consultation (50 CFR 402.14) is required if the Federal agency determines that an action is ‘likely to adversely affect’ a listed species or will result in jeopardy or adverse modification of critical habitat (50 CFR 402.02)”.

“A written request for formal consultation or conference should be submitted to the

Service with a completed biological assessment and any other relevant information (50 CFR 402.12).

FS Response:

A thorough wildlife analysis will be performed, in which the effects to each listed species resulting from the proposed project will specifically be addressed, and the results presented in the BE/BA. If it is determined that a listed species would be adversely affected, the Service would be consulted.

Comment 3.5:

“Candidate species have no legal protection under the Endangered Species Act (ESA). Identification of candidate species can assist environmental planning efforts by providing advance notice of potential listings, allowing resource managers to alleviate threats and, thereby, possibly remove the need to list species as endangered or threatened”.

“Only a Federal agency can enter into formal Endangered Species Act (ESA) section 7 consultation with the Service”.

“The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency”.

“Your attention is also directed to section 7(d) of the ESA, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species”.

FS Response:

If consultation is necessary, the Forest Service will enter into that consultation. No irreversible or irretrievable commitment will occur during the consultation period.

Comment 3.6:

“Raptor surveys and mitigation measures are provided in the Raptor Guidelines as recommendations to ensure that proposed projects will avoid adverse impacts to raptors, including the peregrine falcon”.

FS Response:

A recent raptor survey was conducted of the proposed coal lease modification. No nests are located in or near the proposed project area. Guidelines in the “Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances” will be adhered to.

Comment 3.7:

“Threats that warrant a species listing as a sensitive species by state and federal agencies and as threatened or endangered under the ESA should be significantly reduced or eliminated through implementation of the Conservation Agreement. Project plans should be designed to meet the goals and objectives of these Conservation Agreements”.

FS Response:

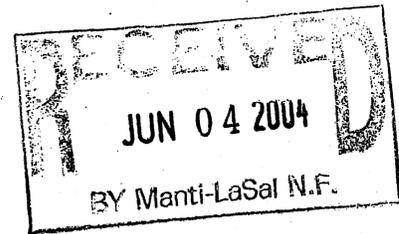
The Colorado River Cutthroat Trout is not found in the proposed project area. Subsidence in the project area would not result in a detectable increase in sedimentation in nearby streams that contain Colorado River Cutthroat Trout.

**Comment Letter 4**

**Navajo Nation Historic Preservation Department (HPD)**

The HPD stated that after reviewing our scoping letter describing the project and cross referencing their sacred sites database, they did not have any immediate concerns with the project and that the project would not impact any Navajo Traditional Cultural Properties.

**5.3 COMMENT LETTERS**



June 2, 2004

Alice Carlton, Forest Supervisor  
Manti-La Sal National Forest  
599 West Price River Drive  
Price, UT 84501

Dear Ms. Carlton,

The substantive Utah Environmental Congress (UEC) comments in response to the Legal Notice of Proposed Action published in the Newspaper of Record on May 4, 2004 for a lease modification to UTU-68082 are below. Please provide a written response to all of our comments in the environmental assessment/environmental impact statement that is prepared, and include them in the project file.

The Legal Notice of opportunity to comment on the Proposed Action states that an "Environmental Analysis" will be conducted. What is that? Coal lease modifications may not be Categorical Excluded from NEPA because they trigger the environmental assessment/environmental impact statement process. We therefore assume that this is not in reference to the more generic 'environmental analysis' that the Manti-La Sal National Forest (MLSNF) usually conducts for CEs. Is this a mistake in the Legal Notice? Is the Forest actually intending to CE the proposed coal lease modification?

COMMENT  
1.1

The Legal Notice of Proposed Action does not provide an adequate description of the Proposed Action. All that exists is a general township and range description of the area of concern (in Township 16 South, Range 7 East, SLM) and a statement that a coal lease modification is proposed in that location. Because the Proposed Action has not been adequately described, the ability of the public and other Agencies to provide comments that are within the scope of the proposed action, that are specific to the proposed action, have a direct relationship to the proposed action and include supporting reasons for the Responsible Official to consider has been diminished. The Legal Notice of Proposed Action has been attached to these comments for reference with attachment #1.

COMMENT  
1.2

This concerned me so I contacted Carl Boyer (the contact person listed in the Legal Notice for more information) this morning, expressing my concern that the Legal Notice did not contain an adequate description of the proposed action that the public is expected to provide substantive comment upon. I asked Mr. Boyer for more detail on what the Proposed Action entails. As an example of what is missing from the Legal Notice, I pointed out to Mr. Boyer that all that is provided is a township and range description identifying the location of the proposed coal lease modification along with a statement that the lease will be modified. There is no description of any restrictions, allowances, stipulations or mitigation that may or may not be associated with the proposed action. Mr. Boyer explained that it would not make sense to attach stipulations and

COMMENT  
1.3

The UEC is concerned that the Proposed Action described in the Legal Notice of Opportunity to Comment on the Proposed Action may be part of a larger action or plan but is being analyzed separately in a manner that is not consistent with NEPA. The CEQ Regulations at 40 CFR part 1508.25(a) (1) state that to determine the scope of EISes, among other things, agencies shall consider three types of actions as "connected" if they:

- Automatically trigger other actions which may require environmental impact statements.
- Cannot or will not proceed unless other actions are taken previously or simultaneously.
- Are interdependent parts of a larger action and depend on the larger action for their justification.

COMMENT  
1.4

Located immediately south of Ridla Canyon, this Proposed Action appears to be an interdependent part of a larger action or plan to expand a coal mine further under the southern end of the East Mountain roadless area. The UEC just submitted scoping comments on another related aspect of this action: the proposed new mine portal roughly 1 mile to the north. Because these two proposals are directly related to, and dependant upon the larger action or plan to expand this mine and provide the necessary new portal(s), we have attached our scoping comments on that project to these comments and hereby incorporate them in their entirety. The UEC believes that the factors listed above apply to these two proposals because they are interdependent parts of the larger action to expand the mine and are dependant on that expansion for their justification. Accordingly, these analyses should be combined into one NEPA analysis, and not inappropriately compartmentalized. [In evaluating the intensity of a proposed action to determine its significance, the CEQ regulations at section 1508.27(7), tell agencies to consider whether "the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or breaking it down into small component parts." The courts have consistently ruled that Agencies are not allowed to avoid their responsibilities for cumulative effects analysis under NEPA by artificially dividing a larger plan or action into smaller components. For example, in *Thomas v. Peterson*, 753 F.2d 754-158 (9th Cir. 1985), the court found that section 102(2) (c) of NEPA requires an EIS for "major federal actions significantly affecting the quality of the human environment." 42USC 4332 (2) (C) (1982). While it is true that the administrative agencies must be given considerable discretion in defining the scope of the environmental impact statements there are situations in which the agency is required to consider several related actions in a single EIS. Not to require this would permit dividing a project into multiple "actions", each of which individually has an insignificant environmental impact, but which collectively have a substantial impact.

Furthermore, we are concerned that many of the current and proposed oil, gas and coal projects on the Wasatch Plateau have cumulative impacts that were not included or anticipated in the scope of the 1986 Manti-La Sal Forest Plan FEIS, or the 1992-1994 amendments that dealt solely with oil/gas cumulative effects and NOT the cumulative effects of subsidence coal mining.

Because of the adverse, long term cumulative effects to forest resources that have not been adequately disclosed or analyzed, we urge the Forest to develop a new programmatic EIS or

COMMENT  
1.5

NT

SEIS that would disclose, discuss, and analyze the significant cumulative impacts to the watershed, Threatened, Endangered species (including Threatened and Endangered fish who may be adversely impacted downstream off of the Forest), as well as Proposed (ESA), Forest Service Sensitive and proposed FS Sensitive species. Cumulative effects to wolverine have never been disclosed or analyzed, and need to be with this analysis. We are also concerned that the irretrievable and irreversible commitments of roadless and wilderness resources have not been disclosed or properly analyzed for this region. Perhaps most importantly, there needs to be a rigorous analysis of the cumulative effects to the watersheds originating on the Wasatch Plateau from the extensive oil, gas AND coal mining. Most, if not all, perennial streams, reservoirs, and springs in this part of the Wasatch Plateau have been affected by the cumulative impacts of oil, gas and coal mining, but there has never been an adequate analysis of the cumulative effects.

The UEC hereby incorporates by reference GIS coverage of our roadless area inventory into these comments. This has been submitted to your Supervisor and/or Forest Planners for inclusion in the Forest Plan Revision record. It is also available in GIS and PDF formats at [www.uec-utah.org](http://www.uec-utah.org). The UEC also requests that the development and analysis of the proposed action and range of alternatives treat our roadless area inventory as a driving issue. We believe that our roadless area inventory should be a driving issue because you are currently in Forest Plan Revision and are in the process of developing a roadless inventory pursuant to the same System-wide criteria that we used (Chapter 7 of FSM 1909.12). Forest Service approval of new, additional subsidence coal mining underneath qualifying roadless lands while you are concurrently preparing your Forest Plan revision may be significant evidence of biased decision making.

The Migratory Bird Treaty Act (MBTA) makes it unlawful to take, kill, or possess migratory bird resources, which includes individuals, their young, their parts, nests, or eggs.<sup>1</sup> Executive Order 13186 issued in January of 2001 re-instituted the responsibilities of Federal agencies to comply with the MBTA. "Take" is defined at 50 CFR 10.12, and includes both "intentional" and "unintentional" take. "Unintentional take" means take that results from, but is not the purpose or, the activity in question. The Forest Service is directed "to support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions". (E.O. 13186 §3(e)) It has been documented that migratory bird species are currently declining across the intermountain west. We recommend the Forest conduct a rigorous evaluation using the newest data and research to minimize impacts to migratory birds (and their habitat), including a focus on species on the 2002 List of Birds of Conservation Concern and species that are listed among the Partner's in Flight Priority Species. To help meet responsibilities under Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), the UEC recommends that you conduct activities outside critical breeding seasons for migratory birds, minimize temporary and long-term habitat losses, and mitigate all unavoidable habitat losses. If your activities occur in the spring or summer, we recommend you conduct surveys for migratory bird resources to assist you in your efforts to comply with the Migratory Bird Treaty Act (16 U.S.C. 703-712) and E.O. 13186. If some portion of your mitigation includes off-site habitat enhancement, it should be in-kind and either within the watershed of the impacted habitat or within the foraging range of the habitat-

<sup>1</sup> 16 U.S.C. § 703-712.

dependent species. To be in compliance with the language and intent of the MBTA and EO 13186, and NEPA's mandate for rigorous analysis, the environmental assessment must disclose and rigorously analyze how the proposed activities would or would not be in compliance with the Migratory Bird Treaty Act and Executive Order 13186. The Forest has been instructed to "develop and implement, within 2 years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service (Service) that shall promote the conservation of migratory bird populations." (EO 13186 § 3) We are not aware of any current MOUs. Please demonstrate within the environmental analysis for this project that such an MOU has been developed and entered into with the USFWS. Because this is an important issue that should inform the public and the decision maker, we request a copy be provided within or as an appendix to the final document, and not simply included in the project file. Writing off this obligation as a vague requirement specific only to the WO is not acceptable, as it is the individual Units of the National Forest System that implement projects that impact migratory bird resources that are protected under this EO and Act.

Rigorous and detailed analysis that constitutes the mandated 'hard look' at the (cumulative) effects to threatened, endangered, proposed, and FS sensitive species from the Proposed Action and alternatives needs to be included in the environmental assessment. This should be informed by accurate quantitative population trend data for all TEPS species. Consultation with U.S. Fish and Wildlife Service should be conducted for the Mexican Spotted Owl (MSO) and Lynx since this area may contain suitable habitat for both listed species, and this is close to the only recent, confirmed Lynx in Utah. Population and habitat surveying for MSO should be conducted throughout the project area and cumulative effects analysis area(s) (which are not disclosed in the Scoping Notice), focusing on cliffs, rock outcroppings, and other escarpments, which may contain MSO or their habitat. The Township and Range description provided identifying the Proposed Action is very close to at least one confirmed active Golden eagle nest that needs to be closely monitored and appropriate mitigation measures need to be provided in the Proposed Action. No mitigation measures have been included in the Proposed Action that the public has been permitted to review and comment upon.

Mule deer, Rocky mountain elk, macroinvertebrates (BCI), goshawk, three toed woodpecker are MIS that should be central issues with the proposed subsidence mining. The Forest Service must comply with applicable law and regulations and conduct a quantitative analysis of population trends of these MIS prior to project approval, in the body of the environmental assessment. (36 C.F.R. §§219.19 and 219.26). The Forest Service needs present population trend data for MIS, and must use this data to determine relationships between the habitat impacts and population changes. Such data must be provided and evaluated in the EA/EIS that is prepared for the project. Specifically, any site-specific analysis must address the impacts of development to MIS, MIS populations, as well as MIS habitat. This is a management short cut that is fundamental in meeting your regulatory mandate to maintain the minimum viable populations and diversity of all native and desirable non-native flora and fauna.

Compliance with the direction, standards, guidelines and other requirements set forth in the MLSNF Forest Plan is also required and must be demonstrated in the EA/EIS and Decision Documents.

COMMENT

COMMENT  
1.12

The subsidence from mining the proposed new coal lease area may have direct, indirect, and cumulative effects to clean water, and compliance with the Clean Water Act must be demonstrated.

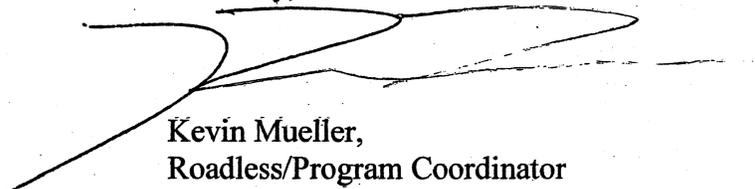
Subsidence coal mining is also known to impact soils and other large woody plants on the surface. Maintenance of the sustainability and diversity of these biotic and abiotic resources (some of which are not renewable) must be demonstrated. Subsidence of the surface may disrupt the soils, hydrology and physiological integrity of the plants that comprise the mixed conifer forest on the surface, making the forest more susceptible to insect and disease. Stressed and insect-infested coniferous forests may or may not present greater risk of wildfire (in terms of ignitability and intensity of burn). These cumulative effects should be disclosed and analyzed.

This is important because actions that indirectly increase the probability or risk of hot crown fire on the surface may involve additional, subsequent cumulative effects that result from loss of species habitat, soils, sedimentation and damage to the blue ribbon trout fishery/sensitive aquatic resources immediately downstream from this area.

We request the opportunity (that is mandated by NEPA) to review and comment on the analysis of the effects that the range of alternatives may have on the environment. Forest Service Handbook, chapter 20, section 23.2 states that the purpose and intent of alternatives are to "ensure that the, range of alternatives does not foreclose prematurely any option that might protect, restore and enhance the environment." NEPA regulations require that agencies should "(r)igorously explore and objectively evaluate all reasonable alternatives ... " This regulatory mandate is NOT limited only to environmental impact statements and includes environmental assessments. Case law has also established that consideration of alternatives which lead to similar results is not sufficient to meet the intent of NEPA.

Please keep the UEC on the mailing list for this project and all projects on the Forest. We also request an opportunity to provide comments on the environmental assessment/environmental impact statement before a decision has been made. If the Forest decides to not grant this request, we ask that a written rationale be provided for that decision. We also ask the Forest to explain how that decision would not constitute a barrier to the public involvement mandated by NEPA.

Sincerely,



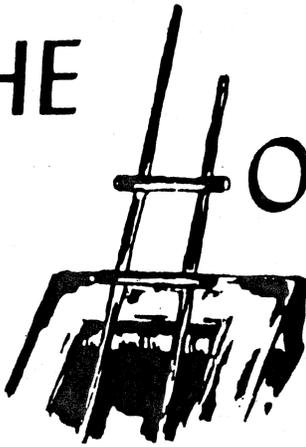
Kevin Mueller,  
Roadless/Program Coordinator

CC:

Wildlaw  
Stephanie Tidwell, UEC Executive Director  
Denise Boggs, UEC board

COMMENT  
1.13

# THE HOPI TRIBE



**Wayne Taylor, Jr.**  
CHAIRMAN

June 3, 2004

Alice Carlton, Forest Supervisor  
Attention: Bruce Ellis  
Manti-La Sal National Forest  
599 West Price River Drive  
Price, Utah 84501

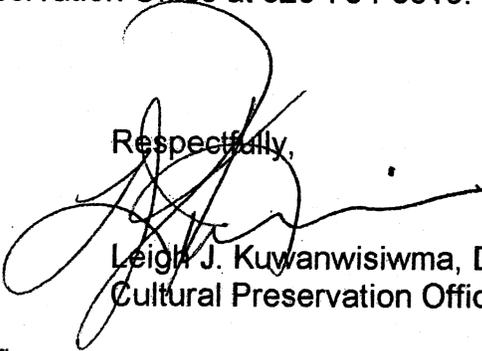
Dear Supervisor Carlton,

This letter is in response to your correspondence dated May 10, 2004, regarding Genwal Resources, Inc. submitting an application to add 120 acres to their Federal Coal lease on Manti-La Sal National Forest. As you know, the Hopi Tribe claims cultural affiliation to the prehistoric cultural groups in Utah and Manti-La Sal National Forest, and therefore we appreciate your continuing solicitation of our input, and your efforts to address our concerns.

As you also know, the Hopi Cultural Preservation Office supports the identification and avoidance of prehistoric archaeological sites and Traditional Cultural Properties. Therefore, to assist us in determining if the area of potential effect for this proposal contains cultural resources significant to the Hopi Tribe, please provide us with a copy of the cultural resource survey report of the project area for review and comment.

If you have any questions or need additional information, please contact Terry Morgart at the Hopi Cultural Preservation Office at 520-734-3619. Thank you again for your consideration.

Respectfully,

  
Leigh J. Kuwanwisiwma, Director  
Cultural Preservation Office

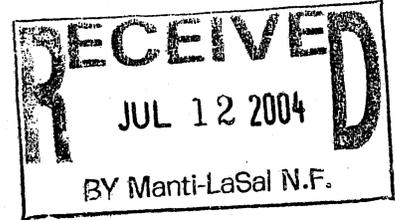
xc: Utah State Historic Preservation Office



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE  
2369 WEST ORTON CIRCLE, SUITE 50  
WEST VALLEY CITY, UTAH 84119



In Reply Refer To

FWS/R6  
ES/UT  
04-0694

July 8, 2004

Alice Carlton  
Forest Supervisor  
Manti-La Sal National Forest  
599 West Price River Drive  
Price, Utah 84501

Dear Ms. Carlton:

The U.S. Fish and Wildlife Service (Service) has reviewed your letter of May 10, 2004 announcing your intent to conduct, with the Bureau of Land Management (BLM) State Office, an Environmental Analysis on the Genwal Resources, Inc. (Genwal) application to add 120 acres to Federal Coal Lease UTU-68082, for the Crandall Canyon Mine. The Utah State Director of BLM must decide whether or not to modify the lease. The Forest Supervisor of the Manti-La Sal National Forest (Forest) must decide whether or not to consent to the lease modification by BLM, and prescribe lease stipulations needed to protect non-mineral resources. The Office of Surface Mining (OSM), Reclamation and Enforcement, is participating as a cooperating agency. We are providing the following comments for your consideration in your analysis.

Pursuant to the Migratory Bird Treaty Act (MBTA)(16 U.S.C. § 703) and the Fish and Wildlife Act of 1956 (16 U.S.C. §§ 742a – 742j, not including 742 d-1), in Section 1 of this letter we identify issues that should be addressed relative to fish and wildlife resources for this project. Section 2 of this letter addresses your responsibilities under section 7 of the Endangered Species Act (ESA) of 1973, 16 U.S.C. § 1536.

### Section 1.

In the fall of 2003 (e-mails, September 23 and December 22, 2003), Diana Whittington of our office suggested to several members of an interagency coal team, including Forest Service personnel, that involved agencies should conduct a cumulative effects analysis of the loss or relocation of perennial surface waters from mining subsidence. We appreciate the support we have received from your staff regarding this issue, because it has broad implications for fish and wildlife resources.

In a response to a request from Diana Whittington (email from John Krummel, January 15, 2004), researchers from the environmental Assessment Division of Argonne National Laboratory provided the following preface to an outline for a cumulative effects analysis:

Coal mining operations in small watersheds can impact existing streams and their associated riparian areas and wetlands. Perennial water sources, such as springs, can be completely lost, subsidence can eliminate viable stream reaches, and canalizations and the use of culverts can alter the existing water balance and dynamics of a small watershed. Changes in the water balance and dynamics of a watershed can then affect ecosystems that depend on the water. These ecosystems include the riparian zone adjacent to the affected stream, associated wetlands, fish populations and macro-invertebrates (e.g., benthic organisms such as mollusks) in the stream, ungulates and other mammals and birds in the vicinity of the impacted reach, and the occurrence and severity of fires.

In addition, loss or relocation of perennial surface water may affect terrestrial species that lack mobility. Such species include mollusks, amphibians, and floral species that are either riparian or seep-obligate.

During a conversation between Diana Whittington of our office and Karl Boyer from the Forest (June 24, 2004), we learned that the area under consideration for mining in this current lease addition presents conditions that may lead to loss of perennial surface water from mining subsidence. According to Mr. Boyer, there are numerous springs in the lower quarter of the 120-acre addition, and the overburden in most of the lower half of the addition is less than 200 feet.

In general, areas with shallow overburden will be more prone to surface cracks from subsidence, and thus more prone to loss of surface water. Also, given the close proximity of the coal seam to the surface, there may be an increased risk to wildlife from contamination of water that seeps through the subsidence cracks and then resurfaces quickly.

In a follow-up email (July 1, 2004), Mr. Boyer relayed the information that 86 acres of the 120-acre proposed lease expansion are dominated by the aspen plant community, with the aspen stands mostly open, with short, scrubby trees. These aspen stands are in the immediate vicinity of the springs and seeps that might be affected by mining subsidence. Loss of these springs and seeps may result in loss of the aspen stands, a primary breeding habitat for a Service Bird of Conservation Concern, the red-naped sapsucker. In addition, aspen stands provide high-value habitat for big game species such as elk and mule deer.

The Service appreciates the continued efforts of the Forest to conserve and protect perennial surface waters. In light of the aforementioned value of perennial surface waters to fish and wildlife resources, we recommend that any mining permitted be limited to mining for non-subsidence in areas where loss of springs or seeps may occur.

Section 2. Federal agencies have specific additional responsibilities under Section 7 of the ESA. To help you fulfill these responsibilities, we are providing an updated list of threatened (T) and endangered (E) species that may occur within the area of influence of your proposed action.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
<b>EMERY</b>		
Barneby Reed-mustard	<i>Schoenocrambe barnebyi</i>	E
Jones Cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	T
Last Chance Townsendia	<i>Townsendia aprica</i>	T
Maguire Daisy	<i>Erigeron maguirei</i>	T
San Rafael Cactus	<i>Pediocactus despainii</i>	E
Winkler Cactus	<i>Pediocactus winkleri</i>	T
Wright Fishhook Cactus	<i>Sclerocactus wrightiae</i>	E
Bonytail <sup>4,10</sup>	<i>Gila elegans</i>	E
Colorado Pikeminnow <sup>4,10</sup>	<i>Ptychocheilus lucius</i>	E
Humpback Chub <sup>4,10</sup>	<i>Gila cypha</i>	E
Razorback Sucker <sup>4,10</sup>	<i>Xyrauchen texanus</i>	E
Bald Eagle <sup>1</sup>	<i>Haliaeetus leucocephalus</i>	T
Mexican Spotted Owl <sup>1,4</sup>	<i>Strix occidentalis lucida</i>	T
Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	C
Black-footed Ferret <sup>6</sup>	<i>Mustela nigripes</i>	E
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E

<sup>1</sup> Nests in this county of Utah.

<sup>4</sup> Critical habitat designated in this county.

<sup>6</sup> Historical range.

<sup>10</sup> Water depletions from *any* portion of the occupied drainage basin are considered to adversely affect or adversely modify the critical habitat of the endangered fish species, and must be evaluated with regard to the criteria described in the pertinent fish recovery programs.

The proposed action should be reviewed and a determination made if the action will affect any listed species or their critical habitat. If it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is complete, and no further action is necessary.

Formal consultation (50 CFR 402.14) is required if the Federal agency determines that an action is "likely to adversely affect" a listed species or will result in jeopardy or adverse modification of critical habitat (50 CFR 402.02). Federal agencies should also confer with the Service on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR 402.10). A written request for formal consultation or conference should be submitted to the Service with a completed biological assessment and any other relevant information (50 CFR 402.12).

Candidate species have no legal protection under the Endangered Species Act (ESA). Candidate species are those species for which we have on file sufficient information to support issuance of a proposed rule to list under the ESA. Identification of candidate species can assist environmental planning efforts by providing advance notice of potential listings, allowing resource managers to alleviate threats and, thereby, possibly remove the need to list species as endangered or

threatened. Even if we subsequently list this candidate species, the early notice provided here could result in fewer restrictions on activities by prompting candidate conservation measures to alleviate threats to this species.

Only a Federal agency can enter into formal Endangered Species Act (ESA) section 7 consultation with the Service. A Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency.

Your attention is also directed to section 7(d) of the ESA, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

Please note that the peregrine falcon which occurs in all counties of Utah was removed from the federal list of endangered and threatened species per Final Rule of August 25, 1999 (64 FR 46542). Protection is still provided for this species under authority of the Migratory Bird Treaty Act (16 U.S.C. § 703-712) which makes it unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. When taking of migratory birds is determined by the applicant to be the only alternative, application for federal and state permits must be made through the appropriate authorities. For take of raptors, their nests, or eggs, Migratory Bird Permits must be obtained through the Service's Migratory Bird Permit Office in Denver at (303) 236-8171.

We recommend use of the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* which were developed in part to provide consistent application of raptor protection measures statewide and provide full compliance with environmental laws regarding raptor protection. Raptor surveys and mitigation measures are provided in the Raptor Guidelines as recommendations to ensure that proposed projects will avoid adverse impacts to raptors, including the peregrine falcon.

COMMENT  
3.6

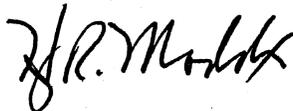
The following is a list of species that may occur within the project area and are managed under Conservation Agreements/Strategies. Conservation Agreements are voluntary cooperative plans among resource agencies that identify threats to a species and implement conservation measures to pro-actively conserve and protect species in decline. Threats that warrant a species listing as a sensitive species by state and federal agencies and as threatened or endangered under the ESA should be significantly reduced or eliminated through implementation of the Conservation Agreement. Project plans should be designed to meet the goals and objectives of these Conservation Agreements.

COMMENT  
3.7

<u>Common Name</u>	<u>Scientific Name</u>
EMERY Colorado River Cutthroat Trout	<i>Oncorhynchus clarki pleuriticus</i>

If we can be of further assistance, or if you have any questions, please feel free to contact Diana Whittington of our office at (801) 975-3330 extension 128.

Sincerely,



Henry R. Maddux  
Utah Field Supervisor

cc: UDWR – SLC and Price (Attn: Craig Walker)  
OSM- Denver (Attn: Ranvir Singh), 1999 Broadway, Suite 3320, Denver, Colorado  
80202  
BLM Sate Office (Attn: Stan Perkes) and Price FO (Attn: George Tetrault)  
UDOGM (Attn: Pam Grubaugh-Littig)



# THE NAVAJO NATION

JOE SHIRLEY, JR.  
PRESIDENT

FRANK DAYISH, JR.  
VICE-PRESIDENT

July 13, 2004

Karl Boyer  
Supervisor's Office  
599 West Price River Drive  
Price, UT 84501

*Subject:* PROPOSED LEASE MODIFICATION AREA T15S R7E SEC. 32.

Dear Mr. Boyer,

The Navajo Nation Historic Preservation Department (HPD) Traditional Cultural Program (TCP) is in receipt of your letter dated May 10, 2004. The letter informs the Navajo Nation of the proposed lease modification, which involves National Forest System lands, administered by the Manti-La Sal National Forest in Emery County, Utah as follows T15S R7E. The current lease will acquire additional coal reserves for their Crandall Canyon Mine.

After reviewing your letter and cross referencing our sacred sites database, the Navajo Nation does not have any immediate concerns with the project and it will not impact any Navajo Traditional Cultural Properties. Your projects are outside of the Navajo Nation aboriginal land use area. Proper planning for these projects is in the best interest of all concerned communities.

HPD-TCP extends our appreciation for including the Navajo Nation's concerns regarding the proposed project and for consulting with the Navajo Nation, pursuant to 36 CFR 800. Should you have any questions or concerns, contact our office at (928) 871-7148. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Begay".

Robert Begay, Program Manager  
Navajo Traditional Culture Program

TCP 04- 033

## **CHAPTER 6**

### **LIST OF PREPARERS**

The following is a list of personnel from the responsible agencies and cooperating agencies included on the project Interdisciplinary Team (IDT):

**Karl Boyer.** Geologist, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

**Bruce Ellis.** Forest Archaeologist, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

**Katherine Foster.** Forest Hydrologist, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

**Gregg Hudson.** Geologist, USDI Bureau of Land Management, Solid Minerals Group, State Office, Salt Lake City, Utah

**Brent Hanchett.** Forest Landscape Architect, USDA Forest Service, Ashley National Forest, Forest Supervisor's Office, Vernal, Utah

**John Healy.** Range Specialist, USDA Forest Service, Manti-La Sal National Forest, Ferron/Price Ranger District, Ferron Office, Ferron, Utah

**Floyd McMullen.** Senior Environmental Project Manager, USDI Office of Surface Mining, Western Regional Coordinating Center, Denver, CO

**Terry Nelson.** Wildlife Biologist, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

**Rodney Player.** Ecosystems Branch Chief, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

**Robert Thompson.** Forest Botanist, USDA Forest Service, Manti-La Sal National Forest, Forest Supervisor's Office, Price, Utah

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## CHAPTER 8 GLOSSARY

***Affected Environment:*** Surface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by proposed activities. The environment of the area that would be affected by the alternatives under consideration.

***Allotment:*** See Range Allotment.

***Alluvial Material:*** Material transported and deposited by running water in riverbeds, lakes, alluvial fans and valleys. Includes clay, silt, sand, gravel, and mud.

***Alternative:*** A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. One alternative need not substitute for another in all respects.

***Analysis Area:*** A delineated area of land subject to analysis.

***Animal Unit Month (AUM):*** The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

***Aquatic Ecosystem:*** All organisms in a water-based community plus the associated environmental factors.

***Aquatic Wildlife or Species:*** Animal species that inhabit and/or depend on the aquatic ecosystems for their life processes.

***Aquifer:*** A layer of geologic material that contains water.

***Big Game Winter Range:*** The area available to and used by big game through the winter season.

***Big Game:*** Larger species of hoofed, protected, wildlife that are hunted such as elk, deer, and moose.

***Biological Assessment (BA):*** A document that discloses potential effects to Threatened, Endangered, and Candidate plant and animal species and consistency with the Endangered Species Act relative to a proposed action.

***Biological Diversity:*** The diversity or numbers of species that collectively represent the living plants and animals within a local, regional, or continental landscape.

**Biological Evaluation (BE):** A document that discloses effects to Forest Service Sensitive plant and animal species relative to a proposed action.

**Browse:** That part of the current leaf and twig growth of shrubs, wood vines, and trees available for animal consumption.

**Bureau of Land Management (BLM):** The U.S. Department of the Interior agency responsible for managing most Federal government subsurface minerals. It has surface-management responsibility for Federal lands designated under the Federal Land Policy and Management Act of 1976.

**CEQ:** See Council on Environmental Quality.

**Contrast:** The effect of a striking difference in the form, line, color, or texture of an area being viewed.

**Council on Environmental Quality:** An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their affect on the environment, conducts environmental studies and advises the President on environmental matters.

**Cultural Resources Inventory:** A survey of existing conditions and data.

**Cultural Resources:** Those fragile and nonrenewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works or art, architecture, and natural features that were or importance in human events.

**Cumulative Impact:** The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

**Developed Recreation Sites:** Relatively small, distinctly defined areas where facilities are provided for concentrated public use (i.e., campgrounds, picnic areas, and swimming areas).

**Developed Recreation:** Recreation that occurs a man-made developments such as campgrounds, picnic grounds, resorts, ski areas, trailheads, etc.

**Dispersed Recreation:** That portion of outdoor recreation use that occurs outside of developed sites in the unroaded and roaded Forest environment (i.e., hunting, backpacking, and camping).

**Displacement:** As applied to wildlife, forced shifts in the patterns of wildlife use either in location or timing of use.

**Distance Zone:** The divisions of a landscape being viewed. Three zones are used to describe a landscape: foreground, middleground, background.

**Diversity:** (1) The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area; or (2) The distribution and abundance of different plant and animal communities and species within the area covered by a Land Resource Management Plan (36 CFR Part 219.3).

**Duration:** The length of time the management activity and its impacts will be taking place.

**Ecosystem:** All organisms in a community plus the associated environmental factors.

**Effects (also see Impacts):**

Direct Effects - Caused by the action and occur at the same time and place.

Indirect Effects - Caused by the action later in time or farther removed in distance but still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

**Endangered Species:** See Threatened and Endangered species.

**Environmental Analysis:** An analysis of alternative actions and their predictable short and long-term environmental effects that include physical, biological, economic, social, and environmental design factors and their interactions.

**Environmental Assessment (EA):** A formal public document prepared to analyze the impacts on the environment of the proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action. It includes a brief discussion of the need for the proposal, alternatives considered, environmental impact of the proposed action and alternatives, and a list of agencies and individuals consulted. Prepared by the responsible Federal agency consistent with 40 CFR 1508.9.

**Erosion:** (1) The wearing away of the land surface by running water, wind, ice, or other geological agents including such processes as gravitational creep; or (2) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

**Exotic:** Foreign, not native

**Fauna:** Species of the animal kingdom.

**Federal Land Policy and Management Act of 1976 (FLPMA):** Public Law 94-579 signed by the President on Management October 21, 1976. Established public land policy; to establish guidelines for its administration; to protect for the management, protection, development, and enhancement of the public lands; and for other purposes.

**Federal Lands:** Lands owned by the United States, without references to how the lands were acquired or what Federal agency administers the land, including surface estate, mineral estate and coal estate, but excluding lands held by the United States in trust for Indians, Aleuts or Eskimos.

**Floodplain:** The lowland and relatively flat area adjoining inland waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

**Flora:** Plants

**Forage:** All browse and herbaceous foods that are available to grazing/browsing animals. Also, food source areas for goshawks.

**Forest Service (FS):** The agency of the United States Department of Agriculture responsible for managing National Forests and Grasslands under the Multiple Use and Sustained Yield Act of 1960.

**Fossil:** The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust exclusive of organisms that have been buried since the beginning of historical time.

**Game Species:** Any species of wildlife or fish for which seasons and bag limits have been prescribed and that are normally harvested by hunters, trappers, and fishermen under State or Federal laws, codes, and regulations.

**Gradient:** The slope (rise/run) of a surface or stream profile.

**Habitat Type:** An aggregation of all land areas potentially capable of producing similar plant communities at climax.

**Habitat:** A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

**Human Environment:** The factors that include, but are not limited to, biological, physical, social, economic, cultural, and aesthetic factors that interrelate to form the environment.

***Impact (See Effects):*** The effect, influence, alteration, or imprint caused by an action.

***Indicator Species:*** A species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

***Indirect Effects:*** Secondary effects that occur in locations other than the initial action or significantly later in time.

***Inventoried Roadless Area:*** Area identified in a set of inventoried roadless area maps, contained in Forest Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at National headquarters office of the Forest Service or any subsequent update or revision of those maps.

***Invertebrate:*** An animal lacking a spinal column.

***IRA:*** Inventoried Roadless Area.

***Irretrievable:*** A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

***Irreversible:*** A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

***Leaseable Minerals:*** Minerals acquired only by lease and generally include oil, gas, coal, oil shale, sodium, potassium, phosphate, native asphalt, solid and semi-solid bitumen, and deposits of sulfur.

***Lease Stipulations:*** Additional specific terms and conditions that change the manner in which an operation may be conducted on a lease or modify the lease rights granted.

***Lease:*** A Federal lease, issued under the oil and gas leasing provisions of the mineral leasing laws, which grants the exclusive right to explore for and produce oil and gas from the lease area.

***Macroinvertebrates.*** Aquatic insects.

***Management Indicator Species (MIS).*** Management Indicator Species (MIS) are a select group of wildlife species that can indicate change in habitat resulting from activities on the Forest. MIS species for the Manti-La Sal National Forest are elk, Mule deer, macroinvertebrates, Goshawk, Golden eagle and Abert squirrel (FLRMP). With

the exception of Abert Squirrels these species utilize the habitats found within the project area.

**Mineral Leasing Laws:** The Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.), and the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359).

**MIS:** Management Indicator Species.

**Mitigation:** Includes:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.
- (c) Rectifying the impact of repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- (e) Compensating for the impact by replacing or providing substitute resources or environments.

**Multiple-use:** Management of the surface and subsurface resources so that they are jointly used in the manner that will best meet the present and future needs of the public without permanent impairment of the productivity of the land or the quality of the environment.

**National Environmental Policy Act of 1969 (NEPA):** Public Law 91-190. Established environmental policy for the nation. Among other items, NEPA requires Federal agencies to consider environmental values in decision-making processes.

**National Forest Management Act (NFMA):** A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest plans and the preparation of regulations to guide that development.

**National Forest System:** All National Forest System lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means the National Grasslands and land use projects administered under Title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 et seq.); and other lands, waters, or interests therein which are administered by the U.S.D.A. Forest Service or are designated for administration through the U.S.D.A. Forest Service as a part of the system (16 U.S.C. 1609).

**National Register of Historic Places (NRHP):** A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance established by the Historic Preservation Act of 1966.

***Negligible Effect or Impact:*** An effect or outcome that is very small in magnitude or importance and is inconsequential.

***NEPA:*** See National Environmental Policy Act of 1969.

***No Action Alternative:*** No action or activity would take place. Another definition is where ongoing programs described within the existing Land Management Plan continue. No decision would be made and no leases would be offered.

***Nongame Species:*** Species of animals that are not managed as a sport hunting/fishing resource.

***Noxious Weeds:*** Rapidly spreading plants that cause a variety of major ecological impacts to both agriculture and wild lands.

***Off-Highway Vehicle (OHV):*** Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, marsh, swampland or other natural terrain. It includes, but is not limited to, four-wheel drive or low-pressure-tire vehicles, motorcycles and related two-wheel vehicles, amphibious machines, ground-effect or air-cushion vehicles.

***Operator:*** A lessee, exploration licensee or one conducting operations on a lease under the authority of the lessee.

***Overstory:*** The portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

***PAOT (People at one Time):*** Unit of measure for recreation representing the number of people using a facility simultaneously or at the same time.

***Prehistoric Site:*** Archaeological sites associated with American Indians and usually occurring before contact with Europeans.

***Prevention of Significant Deterioration (PSD):*** A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 U.S.C. 1875, et seq.).

***Project Area:*** The area to be disturbed by the proposed project and adjacent lands that could be affected.

***Range Allotment:*** A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under an allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands administered by the U.S.D.A. Forest Service.

**Rare Plants:** A plant species, or subspecies, that is limited to a restricted geographic range or one that occurs sparsely over a wider area.

**Reasonably Foreseeable Development Scenario (RFDS):** The prediction of the most likely future actions in the project area that would likely result from the proposed action.

**Reclamation:** Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

**Record of Decision (ROD):** A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

**Recreation Opportunity Spectrum (ROS):** Land delineations that identify a variety of recreation experience opportunities in seven classes along a continuum from primitive to urban. Each class is defined in terms of natural resource settings, activities and experience opportunities. The six classes are: Urban, Rural, Routed, Natural, Semiprimitive Motorized, Semiprimitive Nonmotorized, and Primitive.

**Recreation Visitor Day (RVD):** A unit of measure for recreation use. It represents one day of use by one person.

**Reserves:** Recoverable Oil and Gas deposits.

**Responsible Official:** Official of the Forest Service and/or Bureau of Land Management authorized to make the decisions required under the proposed action.

**Restore:** To bring back landscape to a former or original condition or appearance.

**Revegetation:** The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance such as seed bed preparation, reseeding, and mulching.

**Riparian Ecosystem:** A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

**Riparian:** Riparian areas consist of terrestrial and aquatic ecosystems, those lands in a position to directly influence water quality and water resources, whether or not free water is available. This would include all lands in the active flood channel and lands immediately upslope of stream banks. These areas may be associated with lakes, reservoirs, estuaries, potholes, marshes, streams, bogs, wet meadows, and intermittent or permanent streams where free and unbound water is available.

**Roaded, Natural (RN):** A recreation opportunity classification term describing a land area that has been predominately a natural appearing environment with moderate evidence of sights and sounds of humans. Concentration of users is moderate to low. Roads of better than primitive class are usually with 0.5 mile. A broad range of motorized and nonmotorized activity opportunities are available. Management activities, including timber harvest, are present and harmonize with the natural environment.

**Roadless:** Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

**Scoping Process:** An early and open public participation process for determining particular issues to be addressed in an environmental document and for identifying the significant issues related to a proposed action.

**Sensitive Species:** Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

**Small Game:** Birds and small mammals normally hunted or trapped.

**Stipulation:** A provision that modifies a standard lease right and is attached to and made a part of the lease.

**Surface Management Agency:** The Federal agency with jurisdiction over the surface of federally owned lands containing coal deposits, and, in the case of private surface over Federal coal, the Bureau of Land Management, except in areas designated as National Grasslands, where it means the Forest Service.

**TEPS:** Threatened, Endangered and Sensitive Species.

**Threatened And Endangered Species:** Definitions: Federal codes are defined as follows:

Endangered (E): Any species that is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the ESA would present an overwhelming and overriding risk to man.

Threatened (T): Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate Species (C): Status review taxa for which the USFWS currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list the taxa as an endangered or threatened species.

**Forest Service Sensitive:** Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

***Vertebrate:*** An animal having a spinal column.

***Visual Quality Objectives (VQO):*** Based upon variety class, sensitivity level, and distance zone determinations. Each objective describes a different level of acceptable alteration based on aesthetic importance. The degree of alteration is based on contrast with the surrounding landscape.

**Preservation:** In general, human activities are not detectable to the visitor.

**Retention:** Human activities are not evident to the casual Forest visitor.

**Partial Retention:** Human activities may be evident, but must remain subordinate to the characteristic landscape.

**Modification:** Human activity may dominate the characteristic landscape, but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.

**Maximum Modification:** Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

***Visual Resource:*** The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal of the unit.

***Wetlands:*** Lands where saturation with water is the primary factor determining the nature of soil development and the kinds of animal and plant communities living under or on its surface.

**APPENDIX A**  
**PAST, PRESENT, AND REASONABLY FORSEEABLE**  
**FUTURE ACTIONS**

<b>Past Actions</b>	<b>Implementation Dates (Begin and End)</b>	<b>Residual Effects</b>
<b>I. Minerals</b>		
<p><b>Coal Mining.</b>  <u>Tip Top Mine.</u> On the south slope of Crandall Canyon (SE 1/4 NE 1/4, Sec 5, T 16 S, R 7 E, SLM). The Crandall Canyon Road (FDR 50248), now on the Transportation System, was most likely originally constructed for the mine and coal exploration. The Road is now a Forest Development Road from the SR 31 intersection to just above the Crandall Canyon Mine. The old road that continued up the canyon from the mine (now Forest Development Trail 390) was most likely originally build as a coal exploration/drilling road.</p>	1939-1956	Very small mine. Naturally revegetated. Disturbed area not evident. No residual effects.
<p><u>Crandall Canyon Mine.</u> In Crandall Canyon (S 1/2 NW 1/4, Sec 5, T 16 S, R 7 E, SLM) - The mine was constructed in 1980 and is still an active mine. The mine has disturbed approximately 5.4 acres, not including the Crandall Canyon Road. The Crandall Canyon Road was widened to two lanes and asphalt paved to accommodate coal haul traffic.</p>	1980 - Present	The mine operates 24 hours a day, every day at differing intensities depending on production shifts. 13.6 acres are permitted for disturbance; however, only 9.9 acres have actually been disturbed: 8.2 acres on Genwal fee and 5.4 acres of vegetation/habitat has been removed for operations on the Forest. The physical activity and operations/haul traffic on the Crandall Canyon and Huntington Canyon roads impacts other resources and uses. Approximately 3,900 acres of NFS, State, and private lands included in permit area. Subsidence of mined lands has occurred. No subsidence of Crandall Creek is permitted.
<p><u>Old Leamaster Mine.</u> In Mill Fork Canyon (NE 1/4 SE 1/4 SW 1/4, Sec 16, T 16 S, R 7 E, SLM). The original Mill Fork Road, now a Forest Development Road (FDR 50245), was probably constructed prior to 1943 for access to the mine and for coal exploration. The Forest Development Trail that extends several miles up the canyon, beyond the</p>	1943 – 1964	The old mine was reopened in 1976 as the Huntington Canyon #4 Mine (see below). Most of the original disturbed area was re-disturbed and expanded for the new surface facilities.



County road runs up Deer Creek Canyon from the intersection with Hwy. 31 to the mine, a distance of approximately 3 miles. Road width averages 20 feet. Most of the drainages in the vicinity of the mine are culverted.		
<b>Coal Exploration.</b> Genwal has drilled 3 coal exploration borings from the surface and 12 from within Crandall Canyon Mine.	All drilled prior to mid-1990's.	All have been reclaimed and the reclamation bonds have been released. There are no residual effects.
<b>Gas Exploration/Production.</b> <u>Flat Canyon /Indian Creek Gas Field (East Mountain Unit).</u> Several wells produced gas but have been plugged.  Meridian Oil drilled 6 wells since the early 1980's which are producing natural gas. There is a pipeline on the surface and a compressor station.	1950 – 1970  1982 – Present	These wells have been abandoned and have been revegetated. They are visible only from related slope changes.  Approximately 6 acres (1 acre/well) remains disturbed for gas production. Negligible residual effects are due to drainage and sediment control. Five of the wells are visible from Cottonwood Canyon Road.

<b>II. Recreation</b>		
Flat water fisheries improvements to Cleveland Reservoir, Huntington Reservoir and Potters Ponds  <u>Huntington Canyon Restoration Project.</u> Improvement of over 60 sites and closure and rehabilitation of over 50 sites located along the U31 Highway corridor.	1995-2002  1998-99	Improved access, containment of motorized use, and designation of campsites has tended to improve soil, water, and vegetative components associated with these sites.  Improved access, containment of motorized use, designation of campsites, and streamside restoration activities have all combined to improve soil, water, and vegetative components along the Huntington Canyon corridor. Some displacement of dispersed camping to Lake Canyon area.

<b>III. Range/Vegetation</b>		
Grazing by sheep and/or cattle started shortly after settlement of Emery County.  Rangeland improvements included installation of water troughs, to improve livestock distribution, and drift fences to better control cattle.	1870's  Early 1900's	Agriculture remains a basic industry in the county.  Water troughs made water more available from small springs and seeps. Short fences kept cattle from drifting too far up canyons.

Initiation of improved grazing systems.	1950's and 60's	More formal management prescriptions were established based on evolving scientific information.
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<b>IV. Timber</b>		
<u>Spoon Creek Timber Sale.</u> Four units sold, totaling 413 acres; to remove decadent aspen and promote aspen regeneration.	1993-2000	The first two units have been certified as meeting the objective of 5000 trees per acre and a height of 5 feet. Units 3 and 4 are regenerating well and should be certified in 2005 and 2007.

<b>V. Surface Structures</b>		
<b>Power Lines.</b> <u>Utah Power 345 KV line.</u> Crosses the southwest corner of the Mill Fork Tract (Energy West Mining Co.) in Section 22, T16S, R6E.	1977-Present	Access roads have been reclaimed. Powerline is visually prominent.
<u>Genwal Mine 25 KV line.</u> Carries electricity from Mill Fork Canyon over Mill Fork Ridge and down into Crandall Canyon to power the Genwal Mine.	1989-Present	Access roads have been reclaimed. Powerline is visually prominent.

<b>Present Actions</b>	<b>Implementation Dates (Begin and End)</b>	<b>Residual Effects</b>
<b>I. Minerals</b>		
<p><b>Coal Mining.</b>  <u>Crandall Canyon Mine.</u> Portal and entry development is currently underway on fee property in the South Crandall Lease.</p>	1980 – Present	The mine is in continuous operation. The impacts will continue until the mine is reclaimed.
<p><u>Deer Creek Mine.</u> Entry development in the Mill Fork Tract is currently underway. Access to the Mill Fork Tract is currently provided through the Deer Creek Mine.</p>	Present	The mine is in continuous operation. The impacts will continue until the mine is reclaimed.

<b>II. Recreation</b>		
<p>Ongoing recreation use on East Mountain.</p> <p><u>Lake Canyon Trail System Project.</u> Construction of approximately 9.5 miles of new multiple use trails and closure and reclamation of approximately 7 miles of user created trails.</p> <p><u>Indian Creek Campground Reconstruction Project.</u> New roads, water system, bathrooms, and other improvements are currently being made.</p>	<p>Present</p> <p>Present</p> <p>Present</p>	<p>Dispersed recreation affects soils and vegetation. These impacts are similar to what occurs elsewhere on the forest.</p> <p>Soils and vegetative conditions improved. Impacts to riparian areas minimized. Miller Flat Road improved to accommodate increased traffic volumes.</p> <p>Increased use of facilities once improvements are in place. Increased visitor satisfaction.</p>

<b>III. Range/Vegetation</b>		
<p>Livestock reductions and consolidation of allotments on sheep allotments: Crandall Ridge and Crandall Canyon. A portion of the Crandall Ridge Allotment was moved into the Trail Mountain cattle allotment.</p> <p>Permitted livestock within the area: Gentry Mt. Allotment 1440 cattle, 6/27-9/30. Trail Mt. Allotment 901 cattle, 6/21-9/20. East Mt. Allotment 341 cattle, 6/21-9/10. Crandall Canyon and</p>	2001	<p>Due to changes in sheep operators and concerns for resource conditions, livestock reductions and consolidation of allotments was initiated. Allotment boundaries have been adjusted and permits modified. This will reduce/eliminate grazing impacts on steep head walls in the head of Crandall Canyon mostly on SITLA lands. Monitoring of vegetative and soil trends continue.</p>

<p>Crandall Ridge Allotment, approximately 900 sheep, 7/1-9/30. Horse Creek Allotment 666 sheep, 7/1-9/30.</p> <p>Range improvement inventory.</p>  <p>Range improvement inventory.</p>	<p>1998 – 2001</p>  <p>2002</p>	<p>Prescribed burning of aspen and sagebrush stands on East Mountain were completed to maintain healthy plant communities.</p>  <p>Many water troughs needed replacement or heavy maintenance. Drift fences are still functioning as intended.</p>
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<p><b>IV. Timber</b></p>		
<p>No timber sales are presently occurring.</p>	<p>Present</p>	<p>No effects.</p>

<p><b>V. Surface Structures</b></p>		
<p><b>Power Lines.</b> None are under construction.</p>	<p>Present</p>	<p>No effects.</p>



		would require an additional 3-5 years.
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<b>II. Recreation</b>		
Improving FR 50244 by widening and gravelling.	2005	Improved access to East Mountain would increase recreation use over time. Increased land disturbance and instances of off-road travel are probable. Impacts to wildlife habitat and to soils and vegetation are anticipated.
Improvement and maintenance of nearby existing developed recreation sites such as Flat Canyon Campground, sites in Huntington Canyon, and Indian Creek Campground	Indefinite	Increased use of facilities due to population growth and demand for recreation opportunities. Increased human activity in the area year-round.
Improvement of existing cabins and construction of new cabins on private lands. Potential for construction of new private roads for access to these facilities.	Indefinite	Increased land disturbance, sediment production, and year-round human presence and activity.

<b>III. Range/Vegetation</b>		
<u>SITLA Access Route on East Mountain.</u> Implementation of the project would involve road and well site construction on the Forest and removal of timber outside the Forest boundaries.	2005	An area may need to be closed to grazing unless sheep and cattle can be kept away from areas where new vegetation is being established. It is likely that grazing will need to be withdrawn on most of the SITLA lands during road construction, high logging activity, and while disturbed sites are reclaimed. This would result in an estimated reduction of 159 AUM's. During implementation or recovery periods, transitory range would be recognized and utilized, allowing a temporary increase in grazing.  The proposed roads and drill pad construction sites do not have any noxious weeds at this time. Occasionally musk thistle ( <i>Carduus nutans</i> ) is found in the project area. Sites within 2 miles of this project have dense stands of musk thistle. During the administration of project-related activities, the implementation of noxious weed BMPs would be required in order to prevent the introduction and spread of noxious weeds.
Rangeland monitoring and coordination	Indefinite	New range improvements may be

of grazing with other resource activities.		initiated due to continued monitoring that would include water troughs, and prescribe burning. Through adaptive management new grazing systems may be implemented as scientific information becomes available. The area within the proposed lease area would remain unsuitable for livestock grazing due to steep slopes.
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<b>IV. Timber</b>		
SITLA timber harvest on State-managed land could impact deer and elk by removing or degrading cover habitat on State-managed land on East Mountain.	2005	The timber sale has the potential to affect the following types and amounts of habitat plus whatever is needed for skidding and loading: 161 acres of aspen/mixed conifer, 123 acres of spruce/fir, and 147 acres of mixed conifer/Douglas fir. Increased traffic during timber harvest would also cause increased disturbance in potentially suitable deer and elk habitat along travel routes. Beneficial effects may include reducing conifer encroachment in aspen stands, and reducing fuels build up in conifer stands.

<b>V. Surface Structures</b>		
<b>Power Lines.</b> No new power lines are currently planned.		No effects.

**APPENDIX B**  
**FS AND BLM COAL LEASE STIPULATIONS**  
**FEDERAL COAL LEASE UTU-68082**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

11. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.
12. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.
13. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, or (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.
14. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.
15. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.
16. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.
17. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.
18. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.
19. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a pre-mining land use.
20. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages

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

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

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

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

Forest Supervisor  
Manti-La Sal National Forest  
599 West Price River Drive  
Price, Utah 84501  
Telephone No.: (435) 637-2817

who is the authorized representative of the Secretary of Agriculture.

23. The lessee/operator will be required to drill horizontally ahead of the advance of development workings to the west in the vicinity of the Joes Valley fault zone to locate any faults and determine if they contain significant amounts of water. If significant water is encountered, the operator will be required to take appropriate measures, subject to approval of the Bureau of Land Management and Forest Service, to prevent diverting this water into the mine workings.

24. Except at specifically approved locations, mining that would cause subsidence will not be permitted within a zone along the Joes Valley Fault determined by projecting a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault, down to the top of the coal seam to be mined.

**APPENDIX C**  
**SUPPLEMENTAL FS STIPULATION**  
**MODIFICATION OF FEDERAL COAL LEASE UTU-68082**

**Stipulation #1**

Except at locations specifically approved by the Authorized Officer, with concurrence of the surface management agency, full extraction mining will not be authorized where the fracture zone created by subsidence is projected to reach the surface, as calculated by 50 times the thickness of coal removed plus 50 feet.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791.

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal opportunity employer.

**Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations":** Based on comments received during scoping, no adverse environmental or human health effects on minority or low-income populations have been identified that could result from the proposed action and subsequent decisions. Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, and not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment. Decisions must be consistent with this Order. The decisions of the responsible officials will seek and incorporate public involvement. The decisions must not have a discernible effect on minorities, American Indians, or women, or the civil rights of any United States citizen. Nor must they have a disproportionate adverse impact on minorities or low-income individuals.

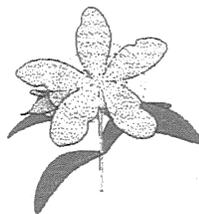
**APPENDIX 3-21**

**PERENNIAL STREAM CONSIDERATIONS AT  
“NO-NAME CREEK” & BLIND CANYON CREEK,  
TRIBUTARIES TO HUNTINGTON CANYON CREEK  
(MT. NEBO SCIENTIFIC)**

**INCORPORATED  
FEB 28 2005  
DIV OF OIL GAS & MINING**

**PERENNIAL STREAM CONSIDERATIONS AT  
"NO-NAME CREEK" & BLIND CANYON CREEK,  
TRIBUTARIES TO HUNTINGTON CANYON CREEK**

**PREPARED FOR  
CRANDALL CANYON MINE  
EMERY COUNTY, UTAH**



*Prepared by*

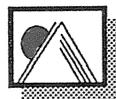
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Springville, Utah 84663  
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*for*

*ANDALEX RESOURCES*  
P.O. Box 1077  
Price, Utah 84501

June 2004



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# **PERENNIAL STREAM CONSIDERATIONS AT "NO NAME CREEK" & BLIND CANYON CREEK, TRIBUTARIES TO HUNTINGTON CANYON CREEK**

## **SUMMARY**

A survey of some of the biological resources in Blind Canyon Creek and "No-Name Creek" suggests that the former could be considered a perennial stream. No-Name Creek, on the other hand, may *not* be perennial due to a variety of considerations, especially in its upper reaches. A conclusive statement at the time of this report regarding its perennial status in the lower section would be premature.

## **INTRODUCTION**

Operators of Crandall Canyon Mine have been interested in ascertaining the perennial status of two creeks that exist somewhat near their current coal mining activities. The first creek has an outlet to Huntington Creek and is located approximately 1 mile north of Crandall Canyon via SR-31 (T15S, R7E, Section 32). This creek has been called "No Name Creek" in this report because it has not been named on the USGS quadrangle maps. The outlet to Huntington Creek for the second stream, or Blind Canyon Creek, is located about 0.5 mile north of No-Name Creek (T15S, R7E, Sections 29 and 32).

Field work on the creeks was accomplished to survey the stream reaches and to obtain data in order to make a determination whether or not they should be considered "perennial", "intermittent" or "ephemeral" based on some biological indicators.

## **METHODS**

Field visits were made to the creeks on three different occasions to assess the biological resource indicators and to note the stream flows. In addition, offices of the State of Utah, Division of Water Rights were contacted and later visited to research any information that they had on file regarding the creeks, especially, No Name Creek. Meetings and correspondence with staff at the USDA Forest Service in Price, Utah were also accomplished to compare definitions and requirements for determinations of perennial stream status.

The field visits of the study area were conducted on May 6, May 14, and June 18, 2004. On each field trip, qualitative notes were recorded pertaining to the creeks and riparian plant communities in the drainages. On the second field visit (May 14, 2004) invertebrate "grab" samples were taken at several locations in the main channels of each creek and were combined to make two composite samples (one composite sample for each creek). Macroinvertebrate species were identified by Dr. Dennis K. Shiozawa (Brigham Young University, Provo, Utah).

## RESULTS

### Perennial Stream Definition

There are several definitions one could use to determine whether a stream is “perennial” or not. One such definition that has been used in studies conducted or reviewed by the USDA Forest Service is shown below:

*“A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Ground water is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for streamflow (USACE, definitions for 2002 Nationwide Permits). The importance of springs in maintaining perennial streamflow is variable and ranges from a major to a supplemental source. A perennial stream is made up primarily of gaining or effluent segments. However, in arid environments, a stream may have losing or influent segments and still be considered perennial if the influent segment has perennial segments up- and downstream of it. Note that the alluvial ground water that supports perennial stream segments originates in a variable source area upstream/up-gradient of the perennial segment. Intermittent streams typically occur in these portions of the source area. Intermittent streams flow during snowmelt runoff and are usually dry by late summer and early fall. Ephemeral streams only flow as a direct response to storm events.”*

### No-Name Creek

As one walks up No-Name Creek from Huntington Canyon Creek, the channel remains fairly straight and consistent, the streambed often comprised of Star Point sandstone (see Fig. 1). At a point nearly 3,000 ft from the outlet there is a confluence called the “Left Fork” and “Right Fork” of No-Name Creek in this report (Figs. 2-4).

No-Name Creek was flowing during each field survey, although the flow decreased with each successive visit. At the time of the last field trip to the site (June 18), less water was flowing from the Left Fork and only a trickle of water was flowing from the Right Fork of the creek. Consequently, most of the water present in the main channel was coming from the Left Fork, gaining flow as it moved downstream.

Species identified by macroinvertebrate sampling suggested that this stream is *not* perennial. The species identified were taxa that do not require year-round flow to complete their life cycles [mostly present were Chironomids (midges) and Simuliids (blackflies)].

Plant species existing in the riparian zones of No-Name Creek strongly suggested the presence of wet or moist soils – but these species could be a result of a perennial *or* intermittent stream. Some of these plants included woody species such as Red-osier dogwood (*Cornus sericea*), quite common in the drainage, and water birch (*Betula occidentalis*), less common in the drainage.

Moreover, herbaceous species such as the grass, redtop (*Agrostis stolonifera*) and pretty shooting-star (*Dodecatheon pulchellum*) also suggested contact with water during much of the year, especially the shooting-star species. However, absent (at least inconspicuous during the time of the field visits) were wetland/riparian species such as rushes (*Juncus* spp.), sedges (*Carex* spp.), bulrushes (*Scirpus* spp.) and spikerushes (*Eleocharis* spp.).

### Blind Canyon Creek

The initial field trips to Blind Canyon Creek suggested that the stream *is* indeed perennial (Figs. 5-6). Indicators for this assumption were many of the plant species mentioned above, active beaver ponds and a host of macroinvertebrate taxa that usually require a year-round water source [i.e. Perlodids (*Isoperla*), Baetids (Baetis), Hydropsychids, Oligochaetes, Pteronarcids and *Ephemerella grandis*].

## DISCUSSION

No information about the two streams was available at the State of Utah, Division of Water Rights. The time line for a perennial stream determination study happened to come at a difficult time of the year to make conclusive findings for some creeks in the Wasatch Plateau. No-Name Creek was one such stream. For example, the study was conducted mostly during peak runoff periods. Moreover, some plant species were in a difficult stage to identify by species. Finally, it was necessary to conduct the last field survey (June 18) on a day following a significant storm event, which undoubtedly influenced the stream flows in the area.

Macroinvertebrate species present in the main channel of No-Name Creek suggested the stream was *not* perennial. However, due to some of the plant species present near this creek, a perennial designation with field work conducted later in the year is certainly a possibility. It does seem more likely than not that the No-Name Creek is *not* perennial, but a survey later in the growing season is the only method to make a conclusive determination of this reach.

As a side note, with more stream monitoring it is also possible that No-Name Creek could be intermittent in the upper reaches (beginning at the fork or confluence described above), but perennial in the lower reaches (main channel) where underground mining has not been proposed. *In other words, the upper reaches near the locations where mining has been proposed near No-Name Creek could probably be classified as "intermittent" in the very near future because these areas had rapidly decreasing flows over time, most of which were already dry by the end of the field portion of the study.*

On the other hand, Blind Canyon Creek drains a much larger surface area when compared to No-Name Creek, supports a variety of macroinvertebrate species that require a continuous water source, sustains more wetland/riparian plant species and supports active beaver populations. A perennial designation of this creek could be assigned with much more confidence at this time.

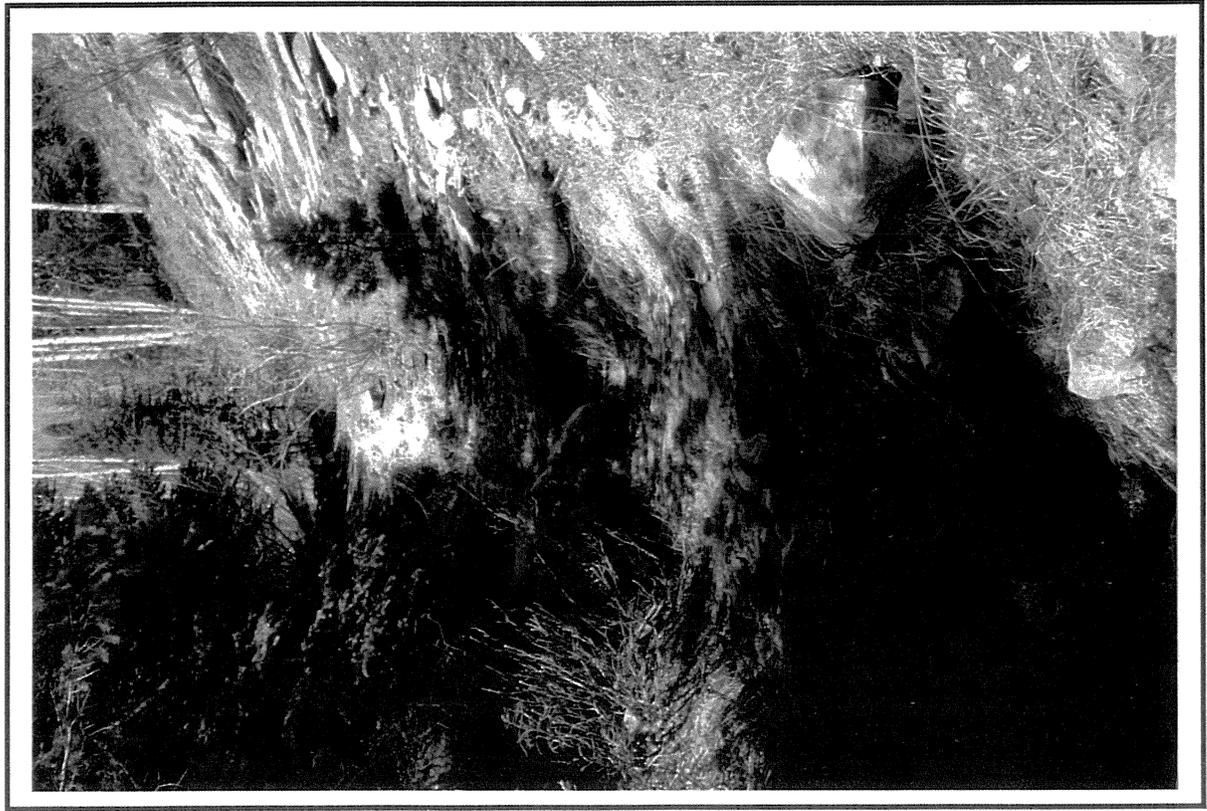


Fig. 1. No-Name Creek Main Channel (May 6, 2004)



Fig. 2. No-Name Creek Left Fork Near Confluence (May 6, 2004)



Fig. 3. No-Name Creek Right Fork Near Confluence (May 6, 2004)

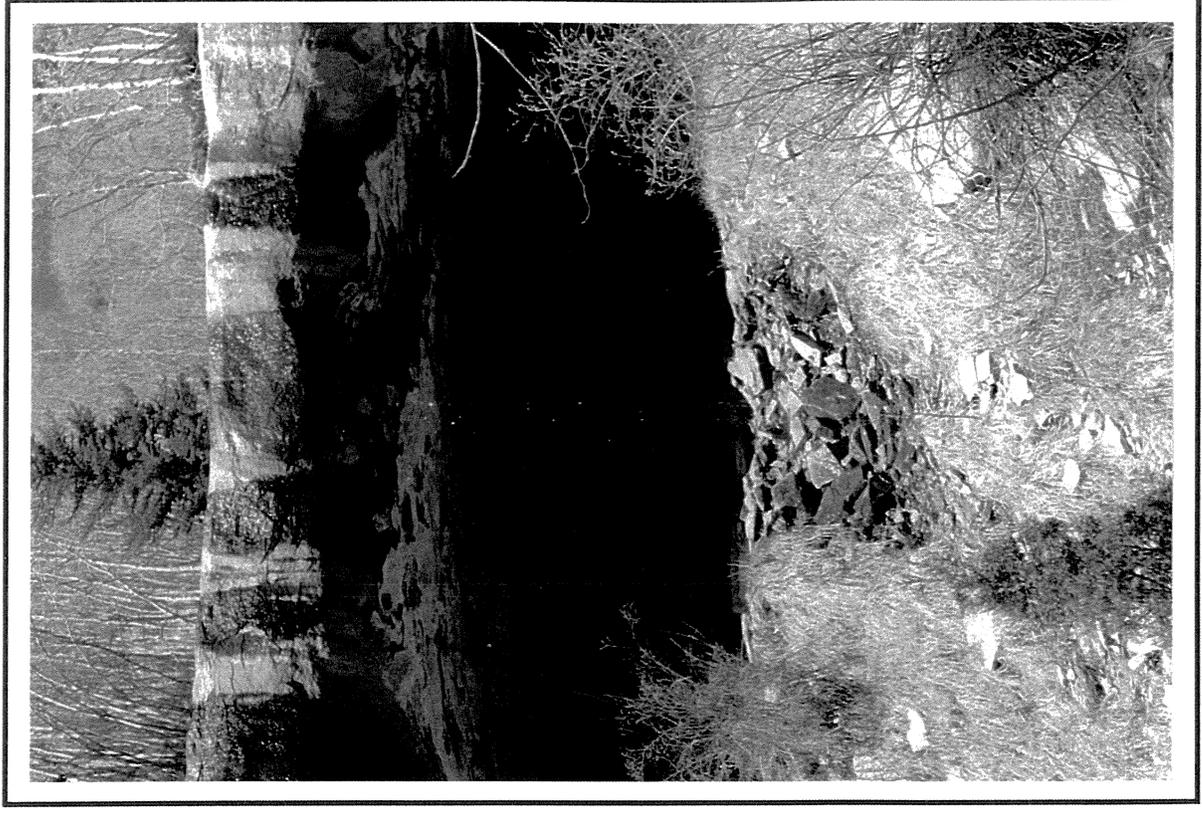


Fig. 4. No-Name Creek Right Fork Waterfall (May 6, 2004)



Fig. 5. Blind Canyon Creek (May 6, 2004)



Fig. 6. Blind Canyon Creek (May 6, 2004)

**CHAPTER 4**

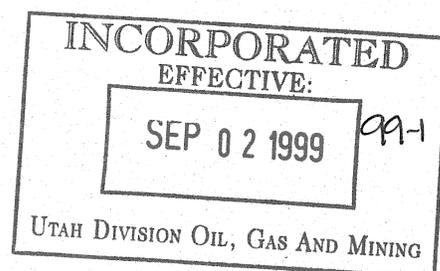
**LAND USE  
(R645-301-400)**

07/98 Revised 04/99

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UTAH DIVISION OIL, GAS AND MINING

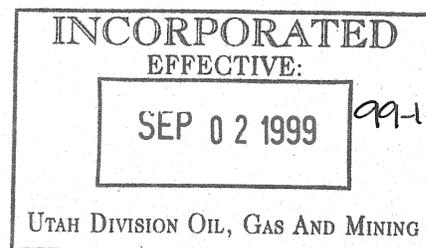
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PLATE 4-2	Landuse Map
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APPENDIX 4-10	Archeology Report, U-68082 Lease Mod Area (Senco-Phenix, 2004)

Note: Bold number plates and appendices are included with this submittal.

INCORPORATED  
FEB 28 2005  
DIV OF OIL GAS & MINING

## CHAPTER 4

### LAND USE

#### 4.10 Regional Land Use

The majority of the land use in the Wasatch Plateau is administered by the United States Forest Service and is managed as a multiple use forest area.

##### 4.10.1 Land Use In Mine Plan Area

Prior to 1939, the permit area was used for non-developed recreation, grazing by native big game species and habitat for small game and non-game animals. From 1939 until 1955, the area was mined by traditional room and pillar methods. Approximately 35,000 tons were removed from the Hiawatha Seam. When mining operations were terminated in 1955, the land reverted to its original uses. In 1983, mining activities were resumed. At present, cattle are moved through the canyon to grazing areas at higher elevations. Riparian areas are grazed during the movement through the canyon. A land use map has been prepared and is included as Plate 4-2.

Mining in the South Crandall lease and the U-68082 lease mod area will not affect the present land use of the area. The area is classified as rangeland. The existing landuse will continue during, as well as following, mining in this area. Refer to Plate 4-2.

After mining operations cease, the mine site surface area will be restored to its approximate original contours. The access road will be left in place, pursuant to the wishes of the U.S. Forest Service (USFS) the surface landowner.

#### 4.11 Premining

The premining use of the land was for dispersed non-developed recreation, native wildlife habitats and dispersed cattle grazing. The wildlife habitats within the mine area are described in Appendix 3.2 and 3.3.

The area was used for a previous mining operation. The previous operation prepared level areas to allow access to the coal seam and for coal loading operations. This made the area more accessible to the general public and to the present mining operation.

The previous operation left lumber, deteriorating buildings, fuel and oil cans, and various other trash in the area. A portion of the existing vegetation was also disturbed with no evidence of revegetation.

After reclamation, the area will be restored to support premining land uses. Vegetation will be restored to provide habitat and a food source for wildlife. It is expected that the cattle grazing will continue after reclamation. The access road will remain pursuant to the wishes of the USFS and to support underdeveloped recreation.

#### **4.11.1 Historic Land Use**

The Manti-La Sal Division of the United States Forest Service has this area shown on their land use map as suitable for dispersed, non-developed recreation, and limited grazing as the slopes are steep. There is not enough of the necessary vegetation for extensive grazing. It is also classified as unsuitable for logging operations as conifer is only a marginal component of the area.

Crandall Canyon is not actually being used as summer range for cattle, but cattle are moved through the canyon to grazing areas at higher elevations. Because the cattle are moved through the canyon, although undesirable, grazing does occur without noticeable depletion of vegetation in the riparian zone. It is expected that sporadic cattle grazing will continue after mine life.

By returning the disturbed area to its original contour, the canyon outside the riparian zone will be too steep for grazing by other than native wildlife. Wildlife grazing and habitat will be part of the postmining land use.

Plate 4-1 shows the grazing allotment boundaries of the existing permit area and the South Crandall lease area and the U-68082 lease mod area. Plate 4-3 presents the oil and gas analysis areas as well as the existing gas wells.

#### **4.11.110 Surface Land Status/Mine Plan Area**

Ownership of the surface rights within and contiguous to the mine plan and permit area is shown on Plates 1-1, 5-3 and 4-1. The surface within the lease areas and the contiguous lands are administered by the USFS. Also as shown on Plate 1-1 there are no structures within 1000' of the mine permit area.

#### **4.11.112 Ownership**

The United States Government under the supervision of the Manti-La Sal National Forest owns most of the surface rights in the immediate area of the permit and mine plan area as shown on Plates 1-1 and 4-4.

#### **4.11.113 Surface Managing Authorities**

The United States Department of Agriculture, Forest Service, Intermountain Region is the surface managing authority.

#### **4.11.114 Utility Corridors and Other Right-Of-Ways**

No utility corridors or other rights-of-way exist on the surface within the existing permit area nor the U-68082 lease mod area. A utility corridor exists within the permit area in the South Crandall lease area. See Plate 4-2. There are no surface or subsurface man-made features within or passing over the permit or Incidental Boundary Change areas.

There has been no change in the premining use of the land within the last five years.

#### **4.11.115 Affect Of Operation On Land Use**

GENWAL feels that greater portion of permit area will not be affected by mining operations and that premining land use will be applicable except for the disturbed area surrounding the portals and the access road.

The maximum area of possible subsidence is shown on Plate 5-2 as the area contained within the zero subsidence contours. As explained in Chapters 5 and 7 no adverse effects are expected to occur as a result of the subsidence mechanisms and no mitigation measures are proposed. In the event subsidence damages or alters streams, roads, etc. GENWAL will repair or replace such structures in conjunction with prudent and reasonable environmental designs and in compliance and agreement with USFS lease stipulations.

#### **4.11.12 Land Capability**

In the Manti-La Sal National Forest Land and Resource Management Plan (LRMP), 1986, the Forest Service has developed certain management objectives for the area. The permit area includes four separate management units.

The bottom of Crandall Canyon is included in the MMA (Leasable Minerals Area) Management Unit where management emphasis is on leasable minerals development. This unit includes the surface facilities for the mine.

The eastern portion of the permit area lies within the GWR (General Big Game Winter Range) Management Unit where management emphasis is on providing general big game winter range.

The north and west areas of the permit area lies within the RNG (Range Forage Production) Management Unit. Management emphasis is on production of forage and cover for domestic livestock and wildlife. The Incidental Boundary Change area lies within the RNG use classification. Surface land uses and resources will not be affected by underground mining operations. The South Crandall lease area lies within the RNG and MWS use classifications (see Plate 4-2). The U-68082 lease mod area lies within the RNG use classification.

The riparian area along Crandall Creek is included in the RPN (Riparian) Management Unit. RPN areas include the aquatic (including fish) ecosystem, the riparian (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet measured horizontally from the edge of all perennial streams and springs, and the shores of lakes and other still water bodies, i.e., from seeps, bogs, and wet meadows. Emphasis is on preservation of the riparian areas and component ecosystem.

The historic use of the land has been for recreation, forestry, wildlife habitat, and mining as indicated by previous zoning, historic documentation and visual examination.

#### **4.11.13 Land Use/Zoning**

Emery County had previously zoned this area as a recreation forestry and mining area. However, as of November 12, 1979, this area has been rezoned to CE-1 which is a critical environment zone. A county zoning of CE-1 does not prohibit mining. Therefore, the area did not have to be rezoned.

#### **4.11.14 Cultural and Historic Resource Information**

A Cultural, Historic and Archeological inventory conducted on June 19 and 20, 1980 on all areas to be disturbed in the proposed permit area. No recorded or unrecorded archeological sites were found in the project area. A copy of the report on the archeological inventory is included as a supplement to this chapter as Appendix 4-1.

All of the areas potentially affected by surface disturbing activities in Genwal's Crandall Canyon Mine Plan were investigated for cultural resources. No prehistoric remains were located in the mine plan area. A single site, however, near a haul road from the mine was recorded in 1975, by the Forest Service. This site (42EM722), a rock shelter, is some 50 meters in length and contains at least one meter of cultural deposits. Remains include stone tools, pottery, lithic debris, abundant charcoal, bone and pictographs on the cliff face above. Extensive vandalism has taken place; however, undisturbed areas in the shelter still remain. The site is eligible for inclusion to the National Register of Historic Places. Therefore, it needs to be protected. The major threats to the site appear to be a direct impact from possible road improvement and present ensuing impacts caused by increased vandalism brought about by the improvement of the road. The site was fenced to be a solution to the vandalism problem.

The archeological site at the mouth of Crandall Creek is not threatened by road improvements and the area is fenced as stated in the plan. The initial road development has progressed along Crandall Canyon past site (42EM722) and Genwal has fenced off the designated site accordingly. A detailed report on the Sherman Shelter was completed by the USFS and is included within this chapter as Appendix 4-4. An additional archeological survey was conducted for LBA #9 in 1992. Data associated with this report are contained in Appendix 4-1A. Additional survey information for the surface facility expansion area is also contained in Attachment 3 in the Addendum to Appendix 3-2.

Since there will be nor surface disturbance within the South Crandall lease area nor the U-68082 lease mod area, no impact to cultural or historic resources will occur. In June, 2004 Senco-Phenix performed an intensive archeological survey of the U-68082 lease mod area and submitted its report to the Forest Service and SHPO. This report is included in Appendix 4-10.

#### **4.11.141 Cultural and Historic Resource Maps**

Cultural and Historic Resource maps are included in Appendix 4-5 and 4-6.

##### **4.11.141.1 Boundaries of Listed Historic Resources**

There are no public parks in the permit area. The only site of historical significance is a archeological site listed as "The Sherman Shelter 42EM722".

##### **4.11.141.2 Location of Cemeteries**

No cemeteries exist within the permit or IBC area or within any adjacent area subject to potential impacts.

##### **4.11.141.3 National Trails/Scenic Rivers**

No trails or the wild and scenic rivers or study area rivers exist within the permit area or areas of potential impact.

#### **4.11.142 State Historic Preservation Officer**

The State Historic Preservation Office in a letter dated August 8, 1980, (see Appendix 4-2) granted cultural resource clearance for the GENWAL Crandall Canyon Mine. Conditional clearance from OSM was provided by a letter dated April 17, 1981 (see Appendix 4-3). GENWAL has followed the recommendations contained in Appendix 4-1, the Archeological Reconnaissance Report, and fenced site 42EM722. With the acquisition of lease UTU-68082, an additional Paleo-Arch inventory was conducted in 1992. That report is attached as Appendix 4-1A. A subsidence monitoring plan is included as part of Chapter 5. According to the SHPO there are no significant cultural resources within the South Crandall lease area nor the U-68082 lease mod area. (See Appendix 4-9)

#### **4.11.142.1 - 4.11.142.2 Prevention of Adverse Archaeological Impacts**

No adverse impacts are anticipated and GENWAL has taken all action outlined and recommended by OSM and the USFS to safeguard the Sherman Shelter.

#### **4.11.143 Historical Resources Eligible for Listing**

GENWAL intends to protect any known historical and cultural resources. Should additional information be required, GENWAL and the requesting regulatory agency will determine the appropriate action.

#### **4.11.143.2 Field Investigations**

Field investigations have been conducted in conjunction with the archeological survey. A map showing the survey area investigated for archeological importance is included as Appendix 4-5.

Although the archeological report mentions a scattering of historic mining remains, they are remains of habitation and human use rather than mining. The remains consist of a rusty automobile body, either a 1939-1940 Ford or Mercury, numerous tin cans and bottles, bedsprings, and piles of wood from old cabins which have been destroyed by vandals. These habitation remains (1939-1955) are of no historic value and no study will be undertaken to document the remains. Maps of the areas investigated are included in Appendix 4-1 and Appendix 4-1A.

#### **4.11.200 Previous Mining**

The mine plan area has been previously mined and the following information is provided.

#### **4.11.210 Mining Method**

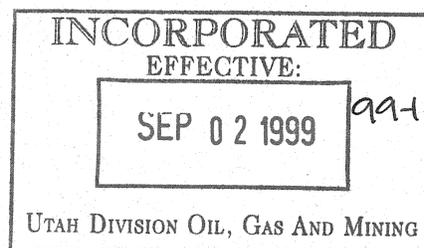
Type of mining method used: room and pillar method of mining.

#### **4.11.220 Coal Seam Mined**

Coal seams mined: Hiawatha seam was the only seam mined.

#### **4.11.230 Extent of Coal Removed**

Extent of coal removed: Approximately 35,000 tons as per USGS calculations.



#### **4.11.240 Dates of Past Mining**

Approximate dates of past mining: November, 1939, to September, 1955, as per USGS records.

#### **4.11.250 Land Use Preceding Mining**

The land was historically used for wildlife and domestic grazing.

### **4.12 Reclamation Plan**

#### **4.12.1 Postmining Land Use Plan**

In areas where surface disturbances resulted from mining operations, soil reclamation and revegetation will restore the areas to their premining usefulness as range land, wildlife habitat and recreational use. The reclamation plans are presented in Chapters 2, 3, 5, and 7.

Land uses are solely at the discretion of the USFS. No alternative land uses have been proposed.

#### **4.12.2 Landowner Or Surface Manager Comments**

The citations from the Manti La Sal National Forest Land and Resource Management Plan can be considered as comments from the Forest Service for most of the disturbed area. The plan states that the road will be left in place pursuant to the wishes of the Forest Service and the surface landowner. Correspondence from the Forest Service indicating the above and outlining attendant reclamation requirements is included in Appendix 1-2.

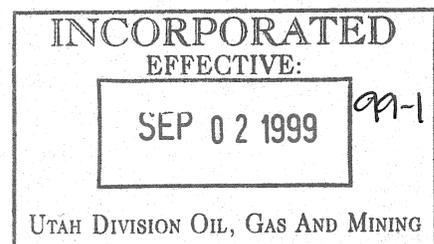
### **4.13 Performance Standards**

#### **4.13.1 Postmining Land Use**

All disturbed areas will be restored in a timely manner to conditions that are capable of supporting the uses they were capable of supporting prior to mining.

#### **4.13.3 Criteria for Alternative Postmining Land Use**

No alternative postmining land use is planned or proposed.



#### **4.20 Air Quality**

#### **4.21 Operation in Compliance with State/Federal Air Quality Laws**

Coal mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act and any other applicable Utah or Federal statutes and regulations pertaining to air quality standards.

#### **4.22 Compliance with Utah Bureau of Air Quality**

GENWAL has an approved air quality permit covering all planned facilities for the Crandall Canyon Mine with the Utah Bureau of Air Quality. A copy of the Air Quality Approval Order Modification is presented in Appendix 4-8.

The air quality permit was revised in August 1997 to incorporate the new surface facilities and mine yard expansion area. The air quality permit was amended and approved prior to operation of the new facilities.

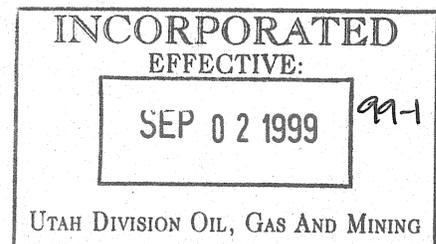
#### **4.23 Fugitive Dust Control Plan**

The Air Quality Approval Order contains the air pollution control plan which includes an air quality monitoring program. The monitoring program will provide sufficient data to evaluating the effectiveness of the fugitive dust control practices and compliance with federal and Utah air quality standards.

A description of the controls and design features associated with the yard expansion can be found in Chapter 5 under section 5.26.

#### **4.24 Fugitive Dust Control Plan for Reclamation Activities**

A fugitive dust control plan is included in Appendix 4-7.



**APPENDIX 4-9**

**LETTER FROM SHPO (SOUTH CRANDALL LEASE)**

**INCORPORATED**  
**APR 15 2005**  
**DIV OF OIL GAS & MINING**

1/23/95 revised 4/97

**SEP 16 2003**



P.O. BOX 1077  
PRICE, UTAH 84501  
PHONE: (435) 564-4000  
FAX: (435) 564-4002

September 9, 2003

Mr. Jim Dykman  
State Historic Preservation Officer  
300 Rio Grande  
Salt Lake City, UT 84181

**Re: Genwal South Crandall Tract**

Dear Mr. Dykman:

GENWAL RESOURCES INC. has applied for a mining permit on a tract of land adjacent to its Crandall Canyon Mine. I talked to you in late June about a survey of the area, the South Crandall Tract. The Division of Oil, Gas and Mining has said that they will be in contact with you about a cultural resources survey of the area. In order to help expedite your review for DOGM, I am enclosing the outline of the tract (Federal Lease UTU-78953) on the Rilda Canyon USGS quadrangle topographical map.

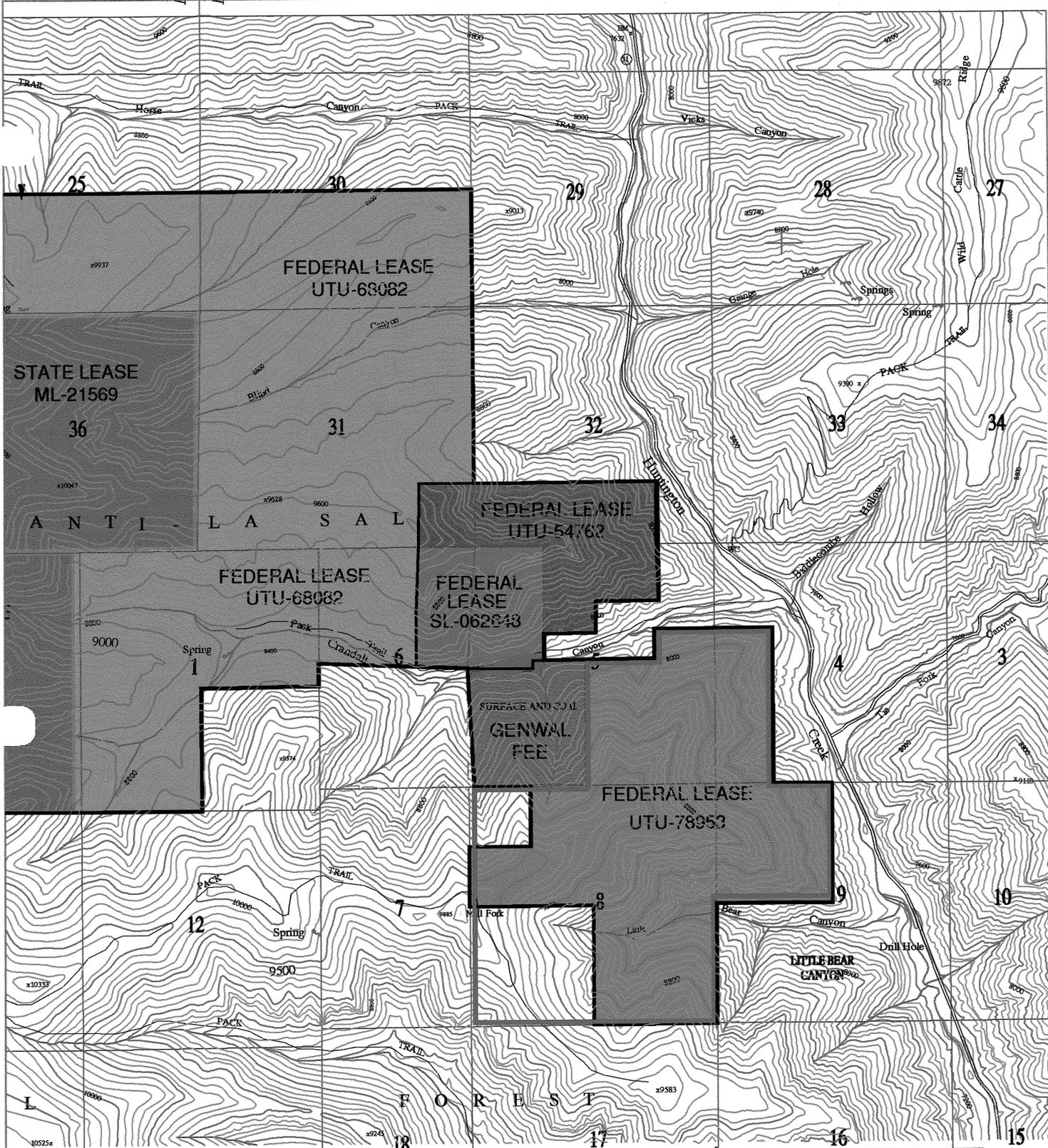
Call me at 435-564-4015 if you have any questions.

Sincerely

A handwritten signature in black ink, appearing to read "G. E. Gray", written over a horizontal line.

Gary E. Gray  
Engineer

INCORPORATED  
APR 15 2005  
DIV OF OIL GAS & MINING



**LEGEND**

- PERMIT BOUNDARY
- AREA OF INTEREST
- MINE SURFACE FACILITIES

THE PERMIT AREA IS ENTIRELY WITHIN THE MANTI-LA SAL NATIONAL FOREST

INCORPORATED

APR 19 2005

DIV OF OIL GAS & MINING



**GENWAL RESOURCES, INC.**

P.O. Box 1077 794 North "C" Canyon Road, Price, Utah  
Telephone (435) 564-4000

**CRANDALL CANYON MINE  
AREA OF INTEREST**

REV:	ACAD REF: AREA OF INTR
DATE: 09/09/03	BY: AK-R
SCALE: 1"=800'	PLATE #:

**APPENDIX 4-10**

**ARCHEOLOGY REPORT, U-68082 LEASE MOD AREA  
SENCO-PHINIX, 2004**

**INCORPORATED  
FEB 28 2005  
DIV OF OIL GAS & MINING**



# SENCO-PHENIX

## AN INTENSIVE AND INTUITIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF THE CRANDALL CANYON MINE SUBSIDENCE AREA

Price Ranger District  
Manti - La Sal National Forest

Emery County, Utah

PERFORMED FOR  
Genwal Resources, Inc.

In Accordance with Forest Service and  
Utah State Guidelines  
Antiquities Permit #U04SC0360f

SPUT-471  
June 22, 2004

John A. Senulis

Direct Charge of Fieldwork



# UTAH SHPO COVER SHEET

**Project Name:** AN INTENSIVE CULTURAL RESOURCE SURVEY AND INVENTORY OF SEVEN DRILL LOCATIONS FOR THE 2001 MILL FORK HELICOPTER ASSISTED DRILLING PROGRAM

**Energy West Mining Company**

**State #U00SC0724f**

**Report Date:** June 21, 2001

**County (ies):** Emery

**Principal Investigator/ Field Supervisor:** John A. Senulis/John Senulis

**Records Search/Location/Dates:** January 26, 2001, Manti-LaSal National Forest, Price

**Acreage Surveyed:** 7 acres

**Intensive Acres:** 7

**Recon/Intuitive Acres:** 0

**U.S.G.S. 7.5 Quad:** Rilda Canyon, Utah (1976)

Sites Reported	Number	Smithsonian Site #(s):
Archeological Sites:	0	
Revisit (No IMACS update)	0	
Revisit (IMACS update attch.)	0	
New Sites (IMACS attached)	0	
Archeological Site Total:	0	
Historic Structures: (USHS Site Form Attached)		
Total NRHP Eligible Sites,	0	

---

## Checklist of Required Items:

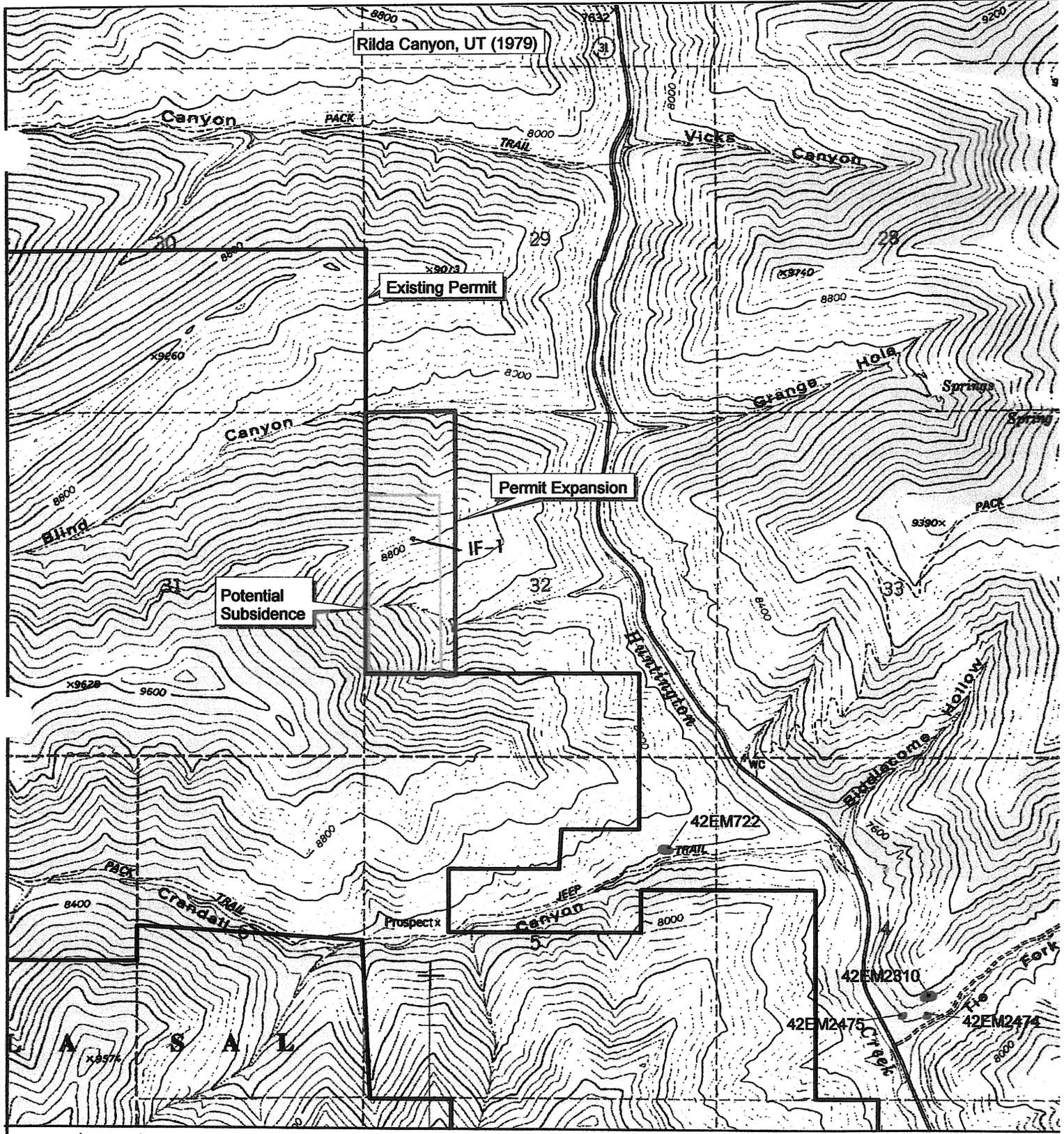
1. X 1 Copy of Final Report
2. X Copy of U.S.G.S. 7.5' map showing surveyed/excavated area
3. Completed IMACS Site Inventory Forms Including
  - \_\_\_\_\_ Parts A and B or C
  - \_\_\_\_\_ IMACS Encoding Form
  - \_\_\_\_\_ Site Sketch Map
  - \_\_\_\_\_ Photographs
  - \_\_\_\_\_ Copy of USGS 7.5' Quad with Smithsonian site Number
4. X Completed Cover Sheet

## Abstract

SENCO-PHENIX performed a combination intensive and intuitive cultural resource survey of the potential subsidence area within the proposed Crandall Canyon Mine permit extension area for Genwal Resources, Inc. The project area included the sandstone cliff faces that may subside when the pillars for the underlying Crandall Canyon mine are removed. The focus was on cliff faces because during subsidence, cliff faces tend to shear off and collapse while there is a minimal effect on other ground. The survey was undertaken at the request of Forest Archeologist, Bruce Ellis, who wanted the areas of the cliff faces examined for possible archeological remains such as rock art, rock shelters, burials or other cliff face type sites. The project area is in the Price Ranger District of the Manti-La Sal National Forest. The purpose of the survey was to identify and evaluate cultural resources that may exist within the project area.

One isolated cultural resource was located. IF-1 is a gray chalcedony biface with inclusions. It measures 51 x 36 x 8 mms. and has only minor edge retouch. It was located at an elevation of 8830 feet, in the SW/SW/NE/SW/NW ¼ of Section 32, T15S, R7E, Emery County, Utah (12-485570-4369471). No other artifacts or features were located and the single artifact is not recommended for nomination to the National Register of Historic Places.

No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended.



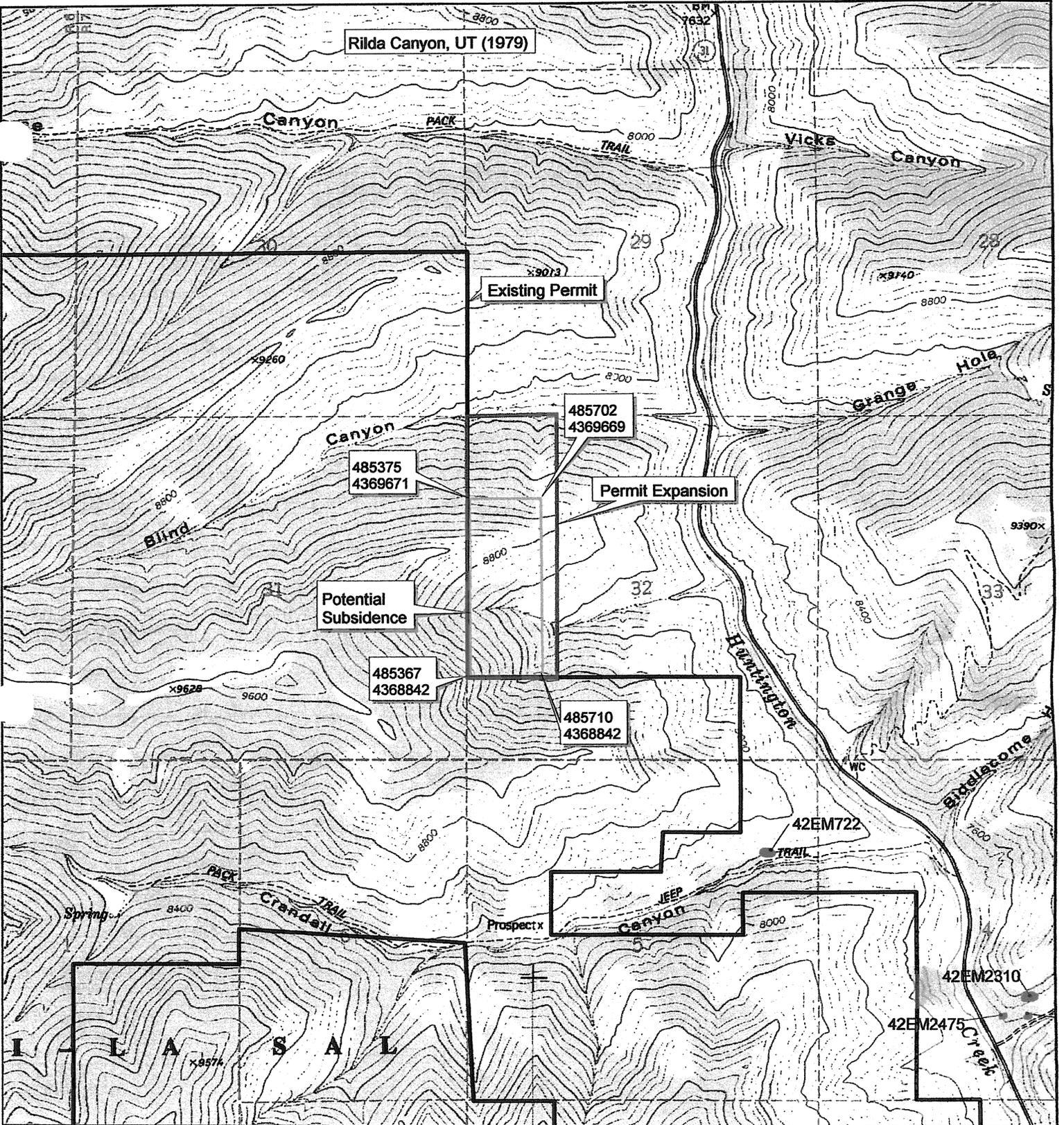
SENCO-PHENIX



Scale 1:24,000  
1" = 2,000'

-  Current Survey
-  Previous Survey
-  Eligible Sites
-  Ineligible Sites

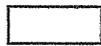
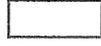
Subsidence Survey  
Crandall Canyon Mine  
Genwal Resources, Inc.  
Emery County, Utah  
Section 32, T15S, R7E  
June, 2004  
SPUT-471



SENCO-PHENIX

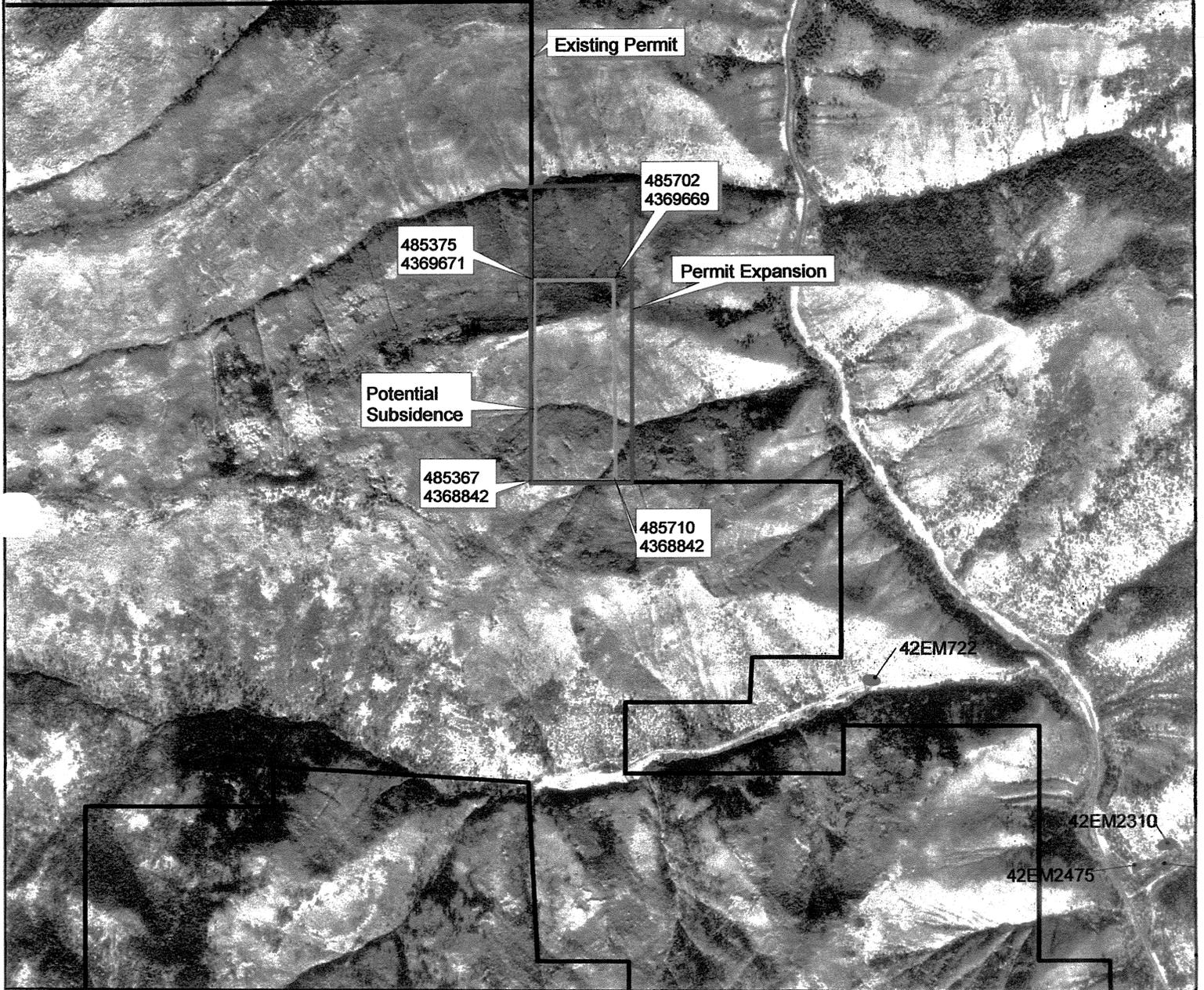


Scale 1:24,000  
1" = 2,000'

-  Current Survey
-  Previous Survey
-  Eligible Sites
-  Ineligible Sites

**Subsidence Survey**  
**Crandall Canyon Mine**  
**Genwal Resources, Inc.**  
**Emery County, Utah**  
**Section 32, T15S, R7E**  
**June, 2004**  
**SPUT-471**

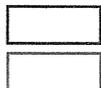
Rilda Canyon, UT (1979)



SENCO-PHENIX



Scale 1:24,000  
1"= 2,000'



Current Survey

Previous Survey



Eligible Sites



Ineligible Sites

Subsidence Survey  
Crandall Canyon Mine  
Genwal Resources, Inc.  
Emery County, Utah  
Section 32, T15S, R7E  
June, 2004  
SPUT-471

## Project Location

The survey area is the steep side slopes on either side of an un-named west to east flowing perennial tributary of Huntington Creek. The project area was located using GIS data on the maps and GPS units in the field. The project area is in the Price Ranger District of the Manti-LaSal National Forest. The potential subsidence area is in Section 32, T15S, R7E, Emery County, Utah. The project area is shown on the enclosed copy of U.S.G.S. 7.5' Quad: Rilda Canyon, Utah (1979).

## Environment

The project area is within the Wasatch Plateau, which is part of the Colorado Plateau Province. The Wasatch Plateau is a north to south trending highland that overlooks the Castle Valley to the east and the Sanpete Valley to the west. The project area is a very steep sided valley and ridge at elevations of 8,000 to 9,100 feet. An un-named perennial creek, in the southern portion of the project area, drains the project area.

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

## Previous Research

John Senulis of SENCO-PHENIX performed a file search in the Forest Service Office on April 30, 2004. The following are the previous studies within or near to the project area which meet professional standards:

- 1975, The archeologist for the Manti La-Sal National Forest surveyed the road through Crandall Canyon for mine development. One cultural resource was located:
  - 42EM722 is the "Sherman" rockshelter, which has apparent depth and was recommended for the National Register of Historic Places. The shelter was beyond the projects impact area.
- 1977, AERC surveyed several sample blocks in the general area. No cultural resources were located. (ML 77-138)
- 1980, UTARC surveyed a 200-foot road corridor and the mine site. No new cultural resource sites were located. (ML 80-228)
- 1981, The Forest Service tested 42EM722 and found it had good depth potential and was eligible for the NRHP. (ML 81-1)
- 1984, SENCO-PHENIX conducted a sample survey just south of the current project area. No cultural resources were located. (ML 84-392)
- 1988, The Forest Service conducted a sample survey, which includes the south 40 acres of the current project area. No cultural resources were located. (ML 88-491)
- 1989, AERC conducted sample surveys west of the current project area. No cultural resources were located. (ML 89-622)
- 1992, AERC surveyed sample units south and west of the current project area. No cultural resources were located.

- 1995, AERC surveyed sample units south of the project area. No cultural resources were located. (ML 95-753)
- 2002, SENCO-PHENIX surveyed drill hole locations south of the current project area. No cultural resources were located. (ML 02-1027)

There are several additional archeological sites ca. 1½ mile south of the project area. All are at the mouth of Tie Fork Canyon and all have been recommended for nomination to the NRHP. They also confirm the model that significant cultural resources within the Huntington Creek drainage tend to be at or near the mouths of the sub-drainages of Huntington Creek.

- 42EM2310 is a rockshelter located ca. ½ mile up the canyon. It has a polychrome pictograph within.
- 42EM2311 is an historic dugout and trail that may have been associated with early logging operations.
- 42EM 2474 is a rockshelter with lithics and groundstone.
- 42EM2475 is a small cave with a possible Ute rock art panel

## Methodology

John and Jeanne Senulis and Robert Evans of SENCO-PHENIX performed a combination Class III intensive walkover and intuitive survey on June 19, 2004 of the sandstone cliff faces in the potential subsidence area. The project area was located using GIS data on the maps and GPS units in the field. The policy of the Manti-La Sal National Forest is to survey sandstone cliff faces in areas of potential subsidence, because the cliff faces often collapse when the pillars are removed from the underlying mine. The sandstone cliff faces were examined for the presence of rockshelters, rock art, burials, or other site types that could occur in these outcroppings. Because of the sheer steepness of the outcrop facings, walkover was limited to the areas where foot travel was possible. Some of the rock faces were examined utilizing both binoculars and a camera with a telephoto lens. There were rock outcrops both along the drainage and on the ridge north of the drainage. These were examined thoroughly as was the intervening steep sloping side hills. All field notes and photographs are on file at the offices of SENCO-PHENIX in Price, Utah.

## Findings and Recommendations

One isolated cultural resource was located. IF-1 is a gray chalcedony biface with inclusions. It measures 51 x 36 x 8 mms. and has only minor edge retouch. It was located at an elevation of 8830 feet, in the SW/SW/NE/SW/NW ¼ of Section 32, T15S, R7E, Emery County, Utah (12-485570-4369471). No other artifacts or features were located and the single artifact is not recommended for nomination to the National Register of Historic Places.

No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended.

These recommendations are subject to modification and review by the Manti La Sal Forest Ranger and the Utah SHPO.



View of the Upper Face looking Northeast



An Example of the Upper Slope Steepness

Genwal Subsidence Project Area



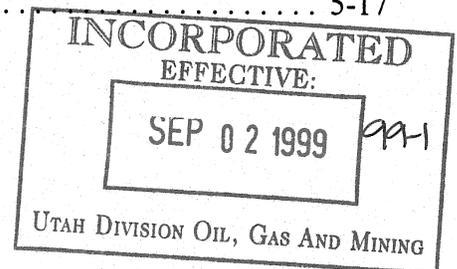
IF-1 Biface *in situ*

**CHAPTER 5**  
**ENGINEERING**  
**(R645-301-500)**

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EFFECTIVE:  
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UTAH DIVISION OIL, GAS AND MINING

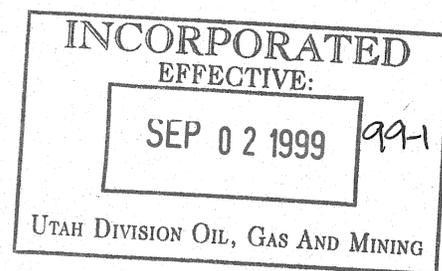
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**CHAPTER 5**  
**ENGINEERING**

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5.11	General Requirements .....	5-1
5.12	Certification .....	5-1
5.13	Compliance with MSHA .....	5-1
5.14	Inspections .....	5-1
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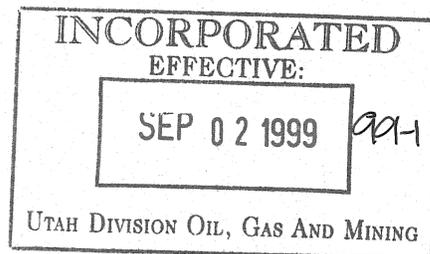
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(Note: Unless otherwise noted, figures follow Chapter 5 text)

Revised 4/05/2003

04/99 Revised 07/99

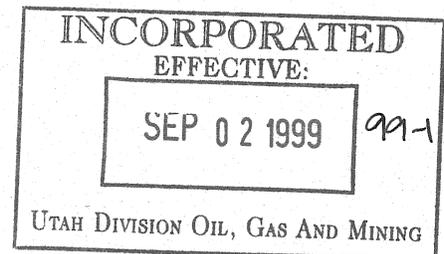
5 - iv

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APR 02 2003  
DIV OF OIL GAS & MINING

**CHAPTER 5**

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5-8	Electrical Substation Installation
5-10	Road Profile and Cross Section
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5-12	Aerial Photography
5-13	Aerial Photography
5-16	Reclamation (Phase I)
5-17	Reclamation (Phase II)

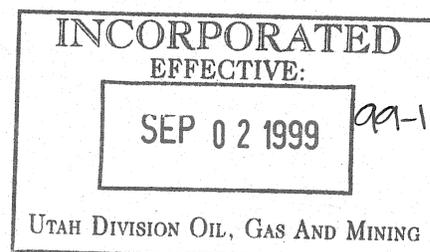


## CHAPTER 5

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5-17A	Reclamation Cross Sections
5-18	Underground Bath House (As Built)
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5-18	Underground Bathhouse, As Built
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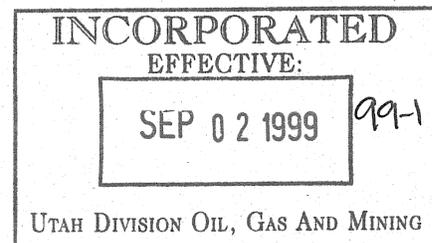
Note: Bold number plates and appendices are included with this submittal.



**CHAPTER 5**

**LIST OF APPENDICES**

<b><u>APPENDIX NUMBER</u></b>	<b><u>DESCRIPTION</u></b>
5-1	Geomechanics Laboratory Report
5-2	Coal Pillar Sizing Report
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## CHAPTER 5

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5-25	Subsidence Survey Letters of Notification

## CHAPTER 5

### ENGINEERING

#### 5.10 Introduction

This chapter will present the Operation Plan, Reclamation Plan, Design criteria, and Performance standards which will affect the mining operations of the Crandall Canyon Mine. The facilities and structures have been and/or will be designed in such a way to minimize the potential impacts of mining operations at the mine site.

#### 5.11 General Requirements

The methods, calculations, maps, plans, and cross-sections pertinent to the operations of the Crandall Canyon Mine Facilities and subsequent reclamation operations are presented in the following sections. These designs are required to comply with the design within the R645-301-500 regulations.

#### 5.12 Certification

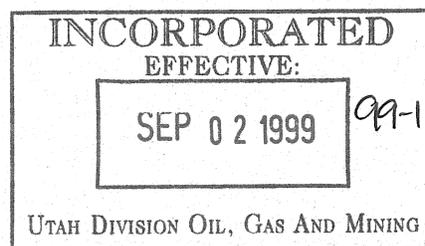
All maps, cross-sections, designs, and plans, as required will be prepared by or under the direction of and certified by a professional engineer or land surveyor.

#### 5.13 Compliance with MSHA Regulations and MSHA Approvals

As required by MSHA, the surface of the mine site is inspected on a quarterly basis, as mandated by law, and on spot inspections as deemed necessary by the governing agency. All mine openings are inspected on a quarterly basis and/or more often if deemed necessary by MSHA. GENWAL will comply with the requirements of both DOGM and MSHA regarding these facilities.

#### 5.14 Inspections

All engineering inspections, except those described under R645-301-514.330, will be conducted by a registered professional engineer or other qualified professional specialist under the direction of the professional engineer.



The existing sedimentation pond will be inspected by a professional engineer or a qualified person under the supervision of a professional engineer on an annual basis. The inspection report, see Figure 5-1, will be certified by the professional engineer and be provided to the Division as part of the annual report.

Quarterly inspections will be performed by a qualified person for appearance of structural weakness and other hazardous conditions, as specified in R645-301-330.

### CERTIFICATION REPORT

On \_\_\_\_\_, 199\_, an inspection of GENWAL Resources sedimentation pond number 1 revealed the following:

- A. The pond has been constructed and maintained in accordance with the approved plan.
- B. The pond's embankment appeared sound with no signs of instability or hazardous conditions.
- C. The water evaluation was \_\_\_\_\_ feet. The water depth was \_\_\_\_\_ feet.
- D. The existing storage capacity is \_\_\_\_\_ acre-feet which is greater than/less than 3.988 acre-feet required by the Mining and Reclamation plan.
- E. The pond is inspected quarterly for signs of structural weakness or problems.
- F. Comments and Remarks \_\_\_\_\_

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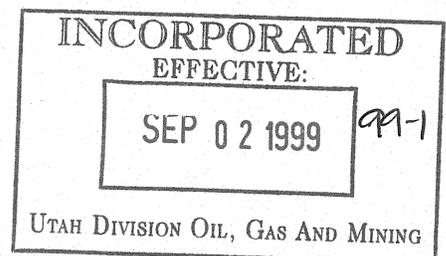
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I have performed the above inspection on this pond to comply with R645-301-514 and do hereby certify the inspection to be a true and accurate representation of the pond at this time.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Figure 5-1. Certification Report Form.





The Sedimentation Pond Inspection Report Form is used to record information from each inspection and is located at the mine site.

## **5.15 Reporting and Emergency Procedures**

### **5.15.10 Reporting a Slope Failure**

At any time a slope failure occurs which may have a potential adverse effect on public, property, health, safety, or the environment, GENWAL will notify the Division promptly of the problem and of any remedial measures planned to correct the problem. If any examination or inspection of the sedimentation pond discloses that a potential hazard exists, the Division will be notified by the fastest available means of the hazards and of the remedial measures to correct such hazards. GENWAL will comply with any remedial measures requested by the Division and agreed upon by the operator.

### **5.15.20 Impoundment Hazards**

If any examination or inspection discloses that a potential hazard exists, GENWAL will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action. If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

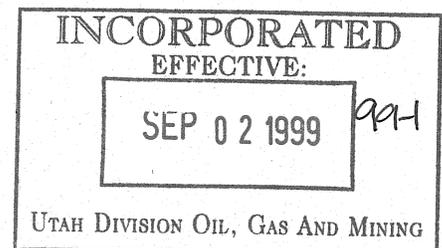
### **5.15.30 Temporary Cessation**

In the event of a temporary cessation of mining operations, as defined by the Division, GENWAL will notify the Division as soon as possible. GENWAL will effectively support and maintain all surface access openings to the underground operations, and secure surface facilities in areas in which there would be no current operations but operations would resume under an approved permit.

Before temporary cessation of coal mining and reclamation operations for a period of 30 days or more, or as soon as it is known that a temporary cessation will extend beyond 30 days, GENWAL will submit to the Division a notice of intention to cease or abandon operations. This notice will be as required by R645-301-515.321.

## **5.20 Operation Plan**

This section presents the operations plan for the Crandall Canyon Mine.



## **5.21 General**

This section presents a description of the plan for operation of the permit area, including descriptions of previously mined and presently mined areas, surface and subsurface facilities, land owner and right-of-way maps, permit area maps, and other feature maps which apply.

### **5.21.11 Previously Mined and Presently Mined Areas**

Plates 5-1 and 5-2 show the location and extent of past and present underground mining operations.

### **5.21.12 Existing Surface and Subsurface Facilities and Features**

The location of surface and subsurface man-made features within, passing through, or passing over the proposed permit area are combined on Plates 5-3, 7-5 and 7-5A. Other detailed plans are as shown on Plate 5-4 (In Mine Sump), Plate 2-2 (Top Soil Storage Piles), Plate 5-6 (Truck Loadout Facility), Plate 5-7 (Rock Dust Silo), Plate 5-8 (Electrical Substation), and Plates 7-4A and 7-6A (Sedimentation Pond Details and Cross-Sections).

The design and details for the USFS road within the permit area are shown on Plate 5-19, sheet 5 of 9 (Concrete Turnaround), sheet 6 of 9 (Layout of the USFS road), sheet 7 of 9 (Gabion Wall), sheet 8 of 9 (Rock Wall Details), and sheet 9 (Upper Parking Area).

### **5.21.13 Landowners and Right-of-Entry and Public Interest Maps**

The landowners of record both surface and subsurface, included in or contiguous to the permit area are shown on Plate 1-1. The permit area on which GENWAL has the legal right to enter is shown on Plate 5-2.

Appendix 1-1, 1-2, 1-3, 1-4, 1-5 and 1-13 shows the legal right of the applicant to enter and conduct coal mining and reclamation operations, and the measures to be used to ensure that the interests of the public and landowners affected are protected under R645-103-234.

GENWAL has included the entire T 16 S, R 7 E, SW1/4 of section 5 in the permit area. GENWAL owns in fee (surface and coal) the entire SW1/4 of section 5, which was previously known as the Dellenbach property. GENWAL acquired the property from ARCO. Previously, only a small portion of the SW1/4 of section 5 had been included in the permit area. Expansion of the surface facility area requires the inclusion of this fee section within the permit area boundary.

GENWAL is requesting an Incidental Boundary Change in order to mine a long, narrow block of coal adjacent to projected longwall panels in Section 2, T. 16 S., R. 6 E. This block contains about 40,000 tons of federal coal that would not otherwise be mined. An Incidental Boundary Change would allow for maximum recovery of the coal reserves by allowing the longwall setup entire and panels to be moved westward but, in no case, would the longwall panels extend into the 22 degree angle projected downward from the surface expression of the Joe's Valley Fault. The amending the permit boundary would include approximately 50 acres in T 16 S, R 6 E as the Incidental Boundary Change area. Refer to Plates 1-1 and 5-2 for GENWAL's existing lease area and the Incidental Boundary Change Area. This addition would allow GENWAL to mine additional coal reserves located on the eastern edge of sections 3 and 10 from their proposed underground workings in section 2 thus optimizing the coal reserves in this area. This coal would not be mineable from the west due to the Joes's Valley fault, nor from the north or south because of limited access.

GENWAL will obtain a coal right-of-way (application has been submitted) from the BLM in order to extend the longwall panels up to the western boundary of section 2. By extending the longwall panels to the western edge of section 2, a total of approximately 300,000 additional tons could be mined in this area of the mine. The Incidental Boundary Change area would consist of first mining only. The right-of-way would accommodate the setup rooms and barrier pillars for the longwall panels allowing the panels to be extended to the western boundary of section 2. The legal description for the area included in the Incidental Boundary Change is as follows:

T. 16 S., R. 6 E.	Section 3	E1/2 E1/2 SE1/4 NE1/4	10 acres
		E1/2 E1/2 NE1/4 SE1/4	10 acres
		E1/2 SE1/4 SE1/4	20 acres
	Section 10	NE1/4 NE1/4 NE1/4	10 acres
TOTAL			50 acres

Refer to Plate 5-2 for mine projections in the IBC area.

GENWAL acquired federal lease UTU-78953 (South Crandall tract) on June 2003 (refer to Appendix 5-24 for right of entry information.) Lease UTU-78953 is described as follows:

T. 16 S., R. 7 E.	Section 4	W1/2 SW1/4,	80.00 acres
		S1/2 SW1/4 NW1/4	20.00 acres
	Section 5	SE1/4	160.00 acres
		S1/2 SE1/4 NE1/4	20.00 acres
	Section 8	E1/2	320.00 acres
		NE1/4 NW1/4	40.00 acres
		S1/2 NW1/4	80.00 acres
	Section 9	NW1/4	160.00 acres
TOTAL			880.00 acres

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GENWAL Resources acquired the SITLA/PacifiCorp sublease in February 2004 (Refer to Appendix 1-14 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.	Section 8	NW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00 acres
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GENWAL Resources acquired the Nielson Fee Lease in April 2004 (Refer to Appendix 1-15 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.	Section 8	SW $\frac{1}{4}$	160.00 acres
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It should be noted that throughout this Mining and Reclamation Plan the combined area (1080 acres) of Federal Lease UTU-78953, the SITLA/PacifiCorp sublease and the Nielson Fee Lease is collectively referred to as the South Crandall lease area, the South Crandall tract, the South Crandall mining area and other similar terms.

GENWAL Resources acquired the modification of Federal Lease U-68082 in March, 2005. (Refer to Appendix 1-15 for right of entry information.) This modification is described as follows:

T.15S., R. 7 E.	Section 32	W $\frac{1}{2}$ NW $\frac{1}{4}$	80.00 acres
		NW $\frac{1}{4}$ SW $\frac{1}{4}$	<u>40.00 acres</u>
		Total	120.00 acres

The Forest Service and GENWAL have agreed to than arrangement whereby a certain portion of the trailhead parking lot can be utilized for GENWAL employee parking under the terms of the existing special use permit. To facilitate the flow of public traffic in and out of the trailhead, GENWAL will construct a barricaded exit from the trailhead out through the existing material storage area. This exit will be kept clear of materials, supplies, vehicles and all other potential obstructions so that the public will have unimpeded egress from the trailhead parking area at all times. Employee parking will be restricted to those designated areas as shown on the drawing in Appendix 5-26, so that a 30' wide area along the perimeter of the parking lot is maintained for public parking and run-around. Within this perimeter parking area no employee parking will be allowed. Signs will be installed to delineate the appropriate designated parking areas. Under the terms of the existing Forest Service special use permit GENWAL will continue to utilize the perimeter area of parking lot for snow storage during the winter months when the public no longer uses the trailhead.

To provide for better utilization of this area the trailhead will be expanded slightly, by less than 0.01 acres, by removing an irregular part of the bank at the upper end of the lot. (Refer to Appendix 5-26). Within this area of excavation topsoil will be salvaged and stockpiled in accordance with the approved reclamation plan. A minimum of 24" of topsoil/subsoil will be salvaged and stored at topsoil pile #4 located at the mouth of Crandall Canyon. A minimum of 32 cubic yards of topsoil material will be salvaged from this bank. Any additional material below the top 24" which, based on visual observation, appears to be suitable growth medium will also be salvaged. Once this additional topsoil material has been placed on the existing storage pile it will be re-vegetated as

required by the Forest Service special use permit. The newly created slope-bank at the trailhead will be re-seeded with a final -reclamation seed mix, exclusive of any clover and/or alfalfa.

GENWAL Resources acquired the SITLA/PacifiCorp sublease in February 2004 (Refer to Appendix 1-14 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.      Section 8      NW $\frac{1}{4}$ NW $\frac{1}{4}$       40.00 acres

GENWAL Resources acquired the Nielson Fee Lease in April 2004 (Refer to Appendix 1-15 for right-of-entry information.) This sublease is described as follows:

T. 16 S., R. 7 E.      Section 8      SW $\frac{1}{4}$       160.00 acres

It should be noted that throughout this Mining and Reclamation Plan the combined area (1080 acres) of Federal Lease UTU-78953, the SITLA/PacifiCorp sublease and the Nielson Fee Lease is collectively referred to as the South Crandall lease area, the South Crandall tract, the South Crandall mining area and other similar terms.

GENWAL Resources acquired the modification of Federal Lease U-68082 in February, 2005. (Refer to Appendix 1-15 for right of entry information.) This modification is described as follows:

T.15S., R. 7 E.	Section 32	W $\frac{1}{2}$ NW $\frac{1}{4}$	80.00 acres
		NW $\frac{1}{4}$ SW $\frac{1}{4}$	<u>40.00 acres</u>
		Total	120.00 acres

#### **5.21.14 Mine Maps and Permit Area Maps**

Plate 1-1 shows leases of the existing permit area (including the South Crandall lease area and the U-68082 lease mod area) and defines the Incidental Boundary Change area. Plate 5-2 shows the boundaries of all areas affected by mining operations, including the proposed underground workings within the IBC area. Plate 5-3 shows the disturbed surface area within the permit area including the culvert expansion. The location and extent of potential subsidence is shown on Plate 6-2.

#### **5.21.15 Land Surface Configuration Maps**

Topographic maps used by GENWAL to depict surface contours within the permit area are represented on Plate 5-3.

#### **5.21.16 Maps and Cross-Sections of the Features and Proposed Features**

Maps produced by GENWAL show the facilities, disturbed area, disturbed area boundary, (Plate 5-3), explosive storage (there is no explosive storage on the surface), and point source discharges (Plate 7-5). These maps are located within this application.

#### **5.21.17 Transportation Facilities Maps**

This application describes each road and conveyor system to be constructed and used by the applicant as required by R645-301-527. Maps supporting this section include Plates 5-3, 5-6, 5-10, 5-19, 7-5, 7-5A, 7-5B and 7-5C.

#### **5.21.18 Support Facilities**

Drawings showing support facilities are located on Plates 5-3, 5-6, 5-7, 5-8, 5-18, 7-5, 7-5A, 7-5B, and 7-5C.

#### **5.21.20 Signs and Markers**

Signs and Markers are posted, maintained, and removed by the operator; will be of uniform design that can be easily seen and read, be made of durable material, and conform to local laws and regulations, and be maintained during all activities to which they pertain. Identification signs will be placed, maintained, and marked in accordance with R645-301-243.

#### **5.21.24 Mine and Permit Identification Signs**

Mine and permit identification signs will be displayed in accordance with R645-301-521.240 through R645-301-521.244.

### **5.21.25 Perimeter Markers**

The perimeter of all areas affected by surface operations or facilities are or will be clearly marked.

### **5.21.26 Buffer Zone Markers**

Signs which have been or will be erected for buffer Zones as required by R645-301-731.600 will be clearly marked.

### **5.21.27 Topsoil Markers**

Markers have been and will be erected to mark where topsoil or other vegetation-supporting material is stockpiled as required under R645-301-234.

## **5.22 Coal Recovery**

The Bureau of Land Management (BLM) and the Utah State Division of Natural Resources govern the conservation and royalty payments of the coal located within GENWAL's proposed permit boundary. Mining plans must be approved by the BLM before mining can occur within the new area. A Resource Recovery Protection Plan (R2P2) is currently on file with the BLM and all federal coal will be mined in accordance with the R2P2 to ensure the diligent development and extraction of all minable coal. (See Appendix 5-24 and Appendix 5-24A)

The lower Blackhawk Formation of the Wasatch Plateau is known to contain two minable seams in this general area. These two seams are locally referred to as the Hiawatha and Blind Canyon (lower and upper coal respectively) seams. Drilling which began in March of 1985, and has since concluded, revealed that the upper seam is not of minable thickness in previous Lease Area. In the South Crandall lease area both seams are minable. In the U-68082 lease mod area only the Hiawatha seam is minable.

In the State lease (M-21568) GENWAL has committed to drilling 150 foot "up-holes" every half-mile in the mains prior to second mining. Installation of the 150 foot up-holes will allow for location and evaluation of the overlying seams for coal production. Mine development plans for the upper seam will be developed and submitted for approval if the horizontal extent and mining conditions make mining the upper seam economically feasible. The BLM has determined the upper seam is not minable and during 1985, approval was given by both the BLM and the Division to commence pillaring of the lower seam.

GENWAL will mine from rock to rock in areas where coal is less than 8' thick and geologic conditions allow. However, in areas where the top is poorly consolidated (i.e. shale partings are present with laminae of carboniferous materials with slickensides) and the roof is not self-supporting, coal top may be left. In addition, on development only, in areas where the coal is more

than 8' thick, coal top or bottom may be left. Within the physical limitations of the mining equipment retreat coal will be mined rock-to-rock in order to maximize resource recovery.

GENWAL has found that in areas of the mine, cutting coal higher than 8' on development results in excess rib sloughage, exposing miners to unnecessary dangers. GENWAL has found that width to height (w/h) ratios lower than 5.6 results in large slabs (2' - 3' thick and 8' high) separating from pillars and sliding or rotating into the entry. These slabs cause an immediate safety hazard to personnel working or traveling in the area and may be classified as accumulations by MSHA. Cleaning up the slabs results in more slabs sloughing which reduces the size of the pillar and results in entries that are wider than legally allowed. For these reasons, GENWAL may not cut higher than 8' on development. Although maximum recovery is an important design criteria, other considerations must be looked at in the final analysis in the extraction of coal. These factors consider the insurance of protection of personnel and the environment. Coal reserves will not be recovered in the following areas:

1. Areas where the coal thickness is less than 5'. Mining below this height is not feasible under current economic conditions.
2. Solid coal barriers will be left to protect main entries from mined out panels and to guarantee stability of the main entries for the life of the mine.
3. Solid coal barriers will be left between particular panels for roof and floor protection.
4. When extreme hazardous conditions exist, and personnel safety is compromised, coal extraction could then be terminated in that area of concern.
5. Coal will only partially be recovered in areas under existing perennial streams within the specified angle of draw with the consent of the Forest Service and approval by the Division. Expected recovery at GENWAL is predicted to be 80% in panels and 60% overall.
6. In areas of development in coal height of 8' or greater, top and/or bottom coal may be left.
7. In panels where the coal height exceeds the effective mining height of the mining equipment, including longwall equipment, either top or bottom coal will be left.

Mining in the South Crandall lease area will be done in accordance with the approved Resource Recover and Protection Plan (R2P2) (See Appendix 5-24). This plan was recommended for approval by the BLM on Nov. 12, 2004. This plan states that full extraction mining (i.e. longwall mining) is not authorized in panels BC-4 and HIA-5 in areas with less than 600' overburden unless it can be determined that these areas can be mined without adverse impacts to the Little Bear

Canyon municipal watershed. Final approval of full extraction mining in these panes will be addressed as a modification to the approved R2P2. Multiple seam mining beyond spring site LB-7 in Little Bear Canyon is contingent upon a monitoring plan approved by the Division in concurrence with the Forest Service at least two years prior to mining in that area.

Maps 5-2 (BC) and 5-2 (H) and Appendix 7-63 show the areas with less than 600' cover affected by this R2P2 condition. These maps show which areas are planned for longwall mining and which areas are planned to be mined with continuous miner units.

According to stipulation #17 of Federal Lease UTU-78953 (see App. 1-13) the Castle Valley Special Service District water treatment plant (constructed as water replacement for Little Bear Spring) must be operational prior to mining in the following areas:

- Mill Fork Graben - Area within 1,000 feet of the southeast corner of the lease in Section 8 (corner of Sections 8, 9, 17, and 16 in T, 16 S., R. 7 E., SLM).
- North of Little Bear Spring (possible water-bearing fracture system) - Area within 1,000 feet of the southern boundary of the lease in Section 9, T. 16 S., R. 7 E., SLM).

It should be noted that under the currently approved R2P2 there is no mining being proposed in either of these areas. The water treatment plant is scheduled for completion in January 2005.

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### 5.23 Mining Methods

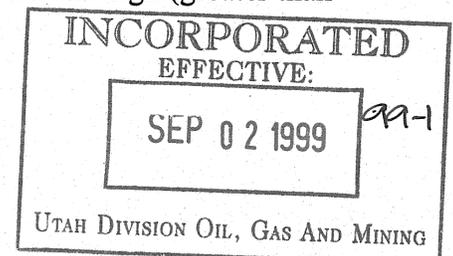
GENWAL will use both Room and Pillar and longwall mining methods for coal production. Projected mine development is depicted on Plate 5-2. In general, room and pillar development mining will be accomplished using continuous mining methods. Retreat mining will use longwall mining and room and pillar methods. The mine plan has been developed to maximize coal recovery in an economical manner.

Second (recovery) mining by continuous miner will occur in those areas which are not longwall mined (Plate 5-2) and will be done in accordance with the approved MSHA roof control plan. Specifically, in areas where long-wall panels cannot be installed due to the presence of stream buffer protection zones or in perimeter areas with irregular boundaries, room and pillar methods will be utilized to maximize coal recovery and still maintain regard for environmental and safety concerns listed in Section 5.22 above. All pillars in the mine, with the exception of barrier pillars or other pillars needed to protect the outcrop, will be fully extracted. However, safety or economic reasons may dictate some pillars or partial pillars remain in place. Pillars used to protect mains, submains, and fire breaks will be left until final retreat or when they serve no useful purpose.

Mining in the Incidental Boundary Change area will consist primarily of longwall gateroads, setup rooms and barrier pillars. (No room and pillar mining will be conducted in the Incidental Boundary Change Area or adjacent areas.) First mining will be done with continuous miners. The longwall entries will be extended to the west but in no case will they extend past the 22 degree angle of draw projected from the surface expression of the Joes's Valley Fault. No pillars will be removed during mining in the Incidental Boundary Change area and consequently, no subsidence will occur. No surface disturbance or breakouts will occur within the Incidental Boundary Change area. Refer to Plate 5-2A.

When mining in the longwall gate entry nears the fault (between 200-300 feet away) an underground drill will be used to drill west toward the fault to determine its location. The drill will drill horizontally toward the fault up to 50 feet ahead of the entry face. If the fault is not encountered, the continuous miner will advance about 30-40 feet toward the fault, leaving at least 10 feet of coal between the entry and the end of the hole. The drill will again drill ahead. This sequence will continue until either water or fault gouge is encountered in the hole or the entry has been developed to its maximum extent (providing no fault was detected). If the fault is encountered prior to reaching the bleeder entries, then mining will stop and the bleeder entries will be relocated. At least 10 feet of solid coal will be left between the face of the entry and the fault. GENWAL will notify the Forest Service and DOGM if substantial water is produced from the drill holes or the fault. Any appreciable outflow from the fault will be monitored.

At least one horizontal hole will be drilled in the headgate and tailgate of each panel. Should water be encountered by the drill hole, the hole would be evaluated. If flow is low to moderate and the flow rate diminishes, drilling would be re-initiated. However, if the flow is high (greater than



50 gallons per minute) and the end of the hole close to the fault, the hole would immediately be plugged and entry development would stop at least 10 feet from the end of the hole.

Although large amounts of water and high pressure have not been previously encountered by mining near the fault, an emergency plan to handle water inundation from the fault has been developed. The plan consists of the following actions:

1. Pull equipment back from face
2. Erect two Kennedy stoppings at least 2 feet apart
3. Place appropriate sized de-water pipe w/valve at bottom of stoppings
4. Pump quick drying cement into the space between the stopping
5. After minimum drying time, close water valve

#### 5.23.10 Mining Operation

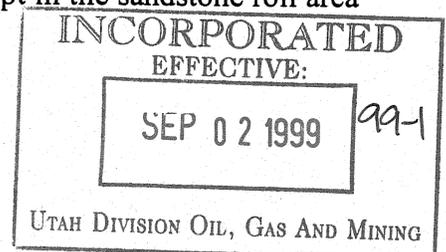
The mine was developed in an area of old works in the Hiawatha seam. Coal was produced from this operation during the period of 1940 through 1955 and was sold locally for domestic use. Certain sections of the old-mine were reopened so that water sumps, ventilation, and coal haulage facilities were re-established. Plate 5-2 illustrates the manner in which the old workings were modified and repaired in order to bring them into compliance with current regulations and the overall mining plans of GENWAL.

Where necessary, the old workings were widened to accommodate a 48-inch coal haulage conveyor. Proper roof supports were placed in areas where questionable roof control conditions were encountered.

The mining operations has accessed the Hiawatha seam by drifting into the seam from the coal outcrop. The portal area for the Hiawatha seam has three entries: one intake ventilation entry, which will also serve as a haulage route, one neutral coal haulage conveyor entry, and one return airway. The portal access area for the mine has the necessary surface support items such as a ventilation fan, conveyor belt drive, power, etc.

#### 5.23.20 Mining History

The Hiawatha seam, is the only seam to be mined on the leases, has an average thickness of 7.5 feet. The coal heights encountered range from 5.5 to 11 feet except in the sandstone roll area



which is approximately 4.5' high as shown on Plate 6-2. The coal within the permit area is high volatile bituminous. The seam will be accessed at an elevation of 7895 feet. The old works in the Hiawatha seam are accessible and it appears that the immediate roof is a competent sandstone, with bedding ranging from laminated to massive, interrupted by an occasional shale-siltstone lenses varying in thickness from approximately six-inches to two-feet. Roof falls in the old works are confined to the siltstone lenses, and where observed, are usually at intersections of rooms and entries. Falls are generally over the width of the opening extending rib to rib and less than 2-feet thick. The historic mine development plans for the Hiawatha seam are illustrated on Plate 5-2.

Mining was completed in lease ML-21569 as shown Plate 5-2. 1st North, a four entry system with 100' X 60' pillars, has been developed off Main West and runs up the eastern side to the northern boundary of the lease, while 1st Right, a five entry system with 100' X 50' pillars, has been developed up the western side to the northern boundary of the lease. 1st North was used as mains for development of pillar sections 1st Left through 9th Left while 1st Right was used as the bleeder for these pillar sections. 1st Left through 9th Left sections have been developed and pillared. 1st North, 1st Right, and Main West will not be retreat mined. These three sections will be left intact to be used as mains in future mining. Typical entry width is 20' wide.

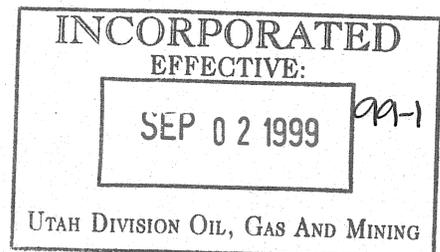
Lease UTU-68082 has been accessed to the east by the use of the 1st North Submains. First (1st) Right through 4th Right have been developed and 2nd mined while 5th, 6th, and 7th Right (longwall gates) still need to be developed to accommodate 6th and 7th Right longwall panels.

GENWAL attempted to access Sections 25 and 30 of Lease UTU-68082 from 1st North section and 1st Right pillar section. This attempt failed due to low coal height. Isopachs show better coal height on the north and west side of Lease UTU-68082. This area will be accessed through Main West by the development of gates for longwall mining.

Lease UTU-68082, sections 26 and 35, will be accessed by the use of the Main West section. Main West will be developed to the west through Section 35. Longwall panels will be developed north off Main West as shown on Plate 5-2.

Lease ML-21568 has been accessed from Main West by a five entry system (South Mains) which extends southward from the Main West Section along the eastern edge of the lease as shown on Plate 5-2. A five entry bleeder system, 2nd South Bleeder, will be developed in conjunction with the longwall panels (Plate 5-2). Longwall mining will commence with 1st Right South longwall panel and end with the 5th Right South longwall panel and will be accessed from South Mains.

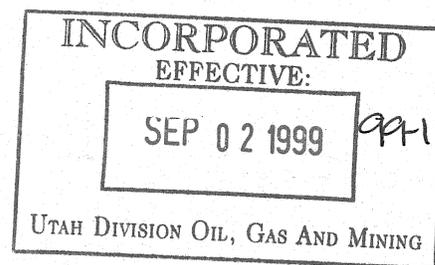
Lease UTU-68082 in Section 1 and 6 will be accessed by the use of the South Mains developed in State Lease ML-21568. Sections 1st Left South through 11th Left South will be developed in that order with the bleeder be developed in conjunction with each section. One longwall panel will be pulled on the east side of South Mains between 1st and 2nd Left South sections (Plate 5-2). 3rd through 11th Left South sections will be room and pillar sections.



GENWAL has made application to the BLM for a right-of-way in order to access federal coal reserves in sections 3 and 10, T. 16 S., R. 6 E. This Incidental Boundary Change application is for a 50 acre modification to the existing permit boundary.

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### 5.23.3 Underground Equipment

Typical mining equipment used in this area will be employed to mine coal in this permit area. Two continuous miners will be employed to mine coal in this lease area. The following is a list of equipment, or equivalent, that may be utilized underground and on the surface as required:

Joy Miners (2) 12 cm 12 (5.5 - 11.5' cutting height)

Roof Bolters (2)

HDDR 13 Fletcher (Min. 6' operating height) (2)

TD143 Lee Norse

Feeder Breakers (2) Stamler 54" (1) Long Airdox 118"

Battery powered scoops and face haulage

Various Electrical Equipment

Long Airdox continuous haulage system

Stamler continuous haulage system

The Longwall System will include:

4LS-2 Joy Longwall Shearer

Kloekner-Becorit Shields (effective 5-7' height) H & B pan line

H & B head and tail drives

American Longwall Stage loader

Appurtenant pumps

Diesel shield haulers

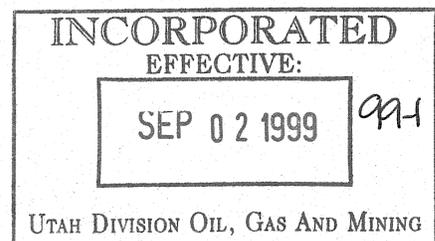
Other appurtenant equipment as needed.

### 5.23.4 Geotechnical

Within the projected mining area, conclusions from existing drill hole data (see Appendix 6-5) and from BLM databases excludes the possibility of multiple minable seams being present. The coal seam to be mined on the GENWAL leases occur in the lower part of the Blackhawk Formation. The Formation is comprised of approximately 1000 feet of gray carbonaceous shales, siltstones, coals, and interbedded sandstones of late Cretaceous age. The Star Point Sandstone, a massive cliff forming 700 to 900 foot thick sandstone unit, underlies the Blackhawk Formation and its top serves as a useful lithologic landmark in the area.

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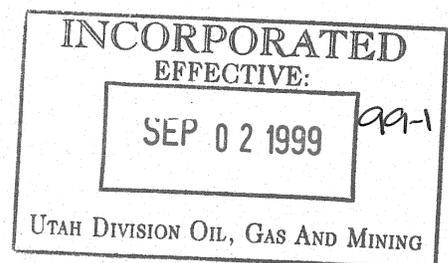
An isopach map of the Hiawatha coal seam overburden appears in Plate 6-6. Overburden thickness above the area to be mined in the permit area ranges from 750' to 2400'. Coal pillar height ranges from 5' to 10' in the permit area. A uniaxial compressive strength of 2400 psi (geomechanical tests, Appendix 5-1) was used in the pillar safety factor calculations.

The formations in the physiographic area dip gently 1 to 3 degrees westward off the west flank of the San Rafael Swell. However, locally the mine is relatively flat experiencing a 0 to 2 degree dip to the southeast. The regional structure is broken by several north-south trending, high angle normal faults which offset the lithologic units from less than 1 foot to 250 feet or more. No faults are projected to be encountered within the proposed mine development area.

### 5.23.5 Initial Pillar Design

Methods used to evaluate safety factors of the pillar design are discussed in Appendix 5-2. Current data indicate that minimum acceptable safety factors range from 1.5 to 2.5. Calculations of previous pillar safety factors are found in Appendix 5-3. Lease ML-21568 pillar safety factors for rooms and main entries ranged from 1.37 to 1.96 and 1.39 to 2.45 respectively. Pillar safety factors for rooms and main entryways in Lease ML-21569 range from 1.47 to 2.45 and 1.78 to 4.37, respectively.

As the ratio of pillar length to height approaches 12, pillars are regarded as being able to bear and load. The pillar recovery plan currently approved by MSHA, DOGM, and the USFS was designed by GENWAL employees with the aid of MSHA Technical Support in Denver and information in a technical report "Coal Pillar Sizing, GENWAL Mine" prepared by Mr. Dan W. Guy of Blackhawk Engineering Co. on 10-1-84. The purpose of the Blackhawk Engineering Report was to evaluate the use of 60' x 60' centers on the entries and rooms during panel development.



### 5.23.5 Revised Pillar Design

Because pillar sloughage did not develop as had been previously calculated, a new pillar design study was undertaken to determine more precisely the existing site conditions. Using values obtained from the above studies, coupled with the new Seratta studies, and 10 years of mining experience at the Crandall Canyon Mine, a new pillar design was determined. The new data conclude that safety factors alone are not adequate for sizing pillars and that site specific overburden conditions must be considered. The table located on page 29 in Appendix 5-2 present the new factors of safety developed for pillar size and overburden thickness.

Roof span design is derived from the accepted practice in the Wasatch Plateau of 20 foot entry and crosscut widths. Previous experience in the Crandall Canyon and nearby mines have supported this roof span width. Roof span in Leases ML-21568 and ML-21569 is 20 feet in entries and crosscuts. Roof support bolting will consist of a minimum 4 foot resin pins with 5 foot centers during development of each section with the exception of the right-of-way UTU-66838. This lease has roof support consisting of a minimum of 4 foot resin pins with 4 foot centers. The floor of the coal seam grades from a clayey shale less than one foot thick to massive sandstone.

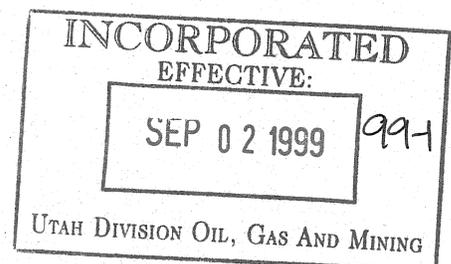
### 5.23.6 Barrier Perimeters

The barrier pillar around the perimeter of the property has been designed according to Utah mining regulations which is based upon the following formula:

$$\text{Width} = 2 * \text{coal thickness of coal to be extracted in feet} + 5 * \text{overburden thickness in feet} / 100 + 10'$$

The perimeter pillar is shown on Plate 5-2. The following selected points were used to establish the pillar size at various locations:

<u>Location</u>	<u>Overburden</u>	<u>Barrier</u>	<u>Coal Height</u>
1. Southwest Corner Tract 1	550 feet	50 feet	6 feet
2. Northwest Corner Tract 2	1550 feet	100 feet	6 feet
3. Western Boundary (Max.)	1700 feet	108 feet	6 feet
4. Northwest Corner U-054762	1500 feet	97 feet	6 feet



### **5.23.7 Annual Production of Coal**

Annual coal production in 1991, 1992, 1993 and 1994 was 877,500, 1,178,089, 1,474,824 and 1,660,900 raw tons, respectively. During 1993-1995 total production tonnage was approximately 1,750,000 raw tons annually. This production was achieved by the use of continuous mining machines, continuous haulage equipment, and/or diesel driven coal haulers. From 1995 to the end of the century total production coal tonnage is forecasted to be 2,500,000 tons, with the aid of longwall mining.

### **5.23.8 Access To Future Reserves**

Access to future reserves will be maintained by the North Mains entries, Main West entries, 1st North, and 1st Right sections. North Mains will maintain access to the mine as well as Main West. Main West will also maintain access to the west and to the South. 1st North will maintain access to the north and east, while 1st Right will maintain access to the north and west. (See Plate 5-2 and page 5-15A). Access to federal coal south and east of the Dellanback fee parcel (i.e., the South Crandall LBA) will be maintained.

### **5.23.9 Projected Mining by Future Permit for the Planned Life of the Mine**

All coal around the permit area has the potential for future mining by the Crandall Canyon Mine. The projected mining for the Incidental Boundary Change area, the Dellanback fee parcel, and the South Crandall lease area is shown on Plate 5-2.

#### **Operating Schedule and Employment**

The mine employees approximately 125 people at present. The mine will operate four eight hour production shifts per day, five days a week. Two maintenance crews will operate 8 hours a day, five days a week, to accommodate rockdusting and general cleanup of the mine. When market or mining conditions dictate, production can be expanded to seven days per week, 52 weeks per year.

### **5.23.10 Safety Training**

The mine is equipped with modern emergency facilities and has an organized safety program. All mine employees are required to meet MSHA first aid and safety training requirements. Visitors are required basic training before entering the mine.

Revised 4/05/2003

04/99 Revised 07/99

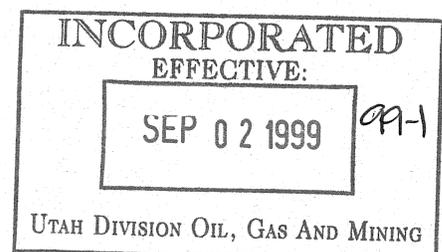
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### 5.23.11 Fire Protection

Fire protection will be maintained in accordance with all Federal and State regulations pertaining to coal mining operations. Additionally the fire prevention plan can be found in Appendix 5-18.

### 5.23.12 Water Systems, Dust Suppression, Dewatering, and Electrical

The sump areas, as shown on Plate 5-4, will have a capacity of approximately 3.0 acre feet of water. The impoundment walls are constructed of concrete block with mortared joints and sealed on both sides. All the contact areas around the walls are sealed with concrete to prevent seepage. These sumps are constructed to allow the sediment to settle out and have an oil skimmer installed, as shown on Plate 5-4, to allow the water to be pumped directly to Crandall Creek under a UPDES permit. All water pumped to Crandall Creek will meet all effluent limitations and will be sampled in accordance with the UPDES permit requirements. Refer to Plate 5-3 for the location of the UPDES discharge point.

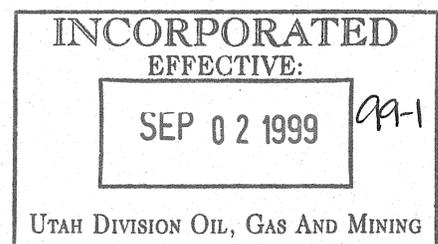


## 5.24 Blasting

There are no structures or dwellings within one mile of the mine permit area. All blasting will be done under the direction of a person trained, examined and certified as provided by 30 CFR 850 and applicable regulations of the State Industrial Commission. The use of explosives will be done in accordance with R645-301-524 and all records as outlined in R645-301-524.700 will be kept at the mine site or at the mine office in Huntington, Utah for a period of at least three years.

GENWAL will post blasting signs, in accordance with R645-301-524.510, in the vicinity of the surface blasting operations indicating that blasting is being done in the area and the audible signals and meanings. GENWAL will limit access to people from the area immediately prior to and after the blast until the applicants representative determines all is clear. Signals, audible within a half mile, will be given prior to and after the blast as outlined in R645-301-465.

The amount of explosives used within any 8 millisecond period will be determined with the following equation as outlined in R645-301-524.651. Blasting will be done between sunrise and sunset, unless other criteria is met in R645-301-524.420. Blasting will be done so as no fly rock will leave the permit area, where practical. Netting will be used to achieve this where there exists a possibility of this occurrence. Flyrock traveling in the air or along the ground will not be cast from the blasting site more than  $\frac{1}{2}$  the distance to the nearest occupied structure; beyond the area of control required under R645-301-524.530.



## 5.25 Subsidence

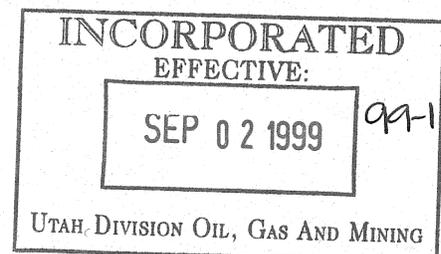
The term "subsidence" applies to the deformation or movement in the overburden. The thickness of the overburden ranges from zero at the outcrop to approximately 2400 feet, as shown on Plate 6-2. In general, the strength of the overburden is typical of the late Cretaceous sediments being mined in Eastern Utah and Western Colorado. However, it should be noted that the overburden at the Crandall Canyon mine has substantially more massive sandstones than in other areas (i.e., the Deer Creek Mine). Thus, providing greater overburden strengths and reducing the potential for significant subsidence.

Four methods have been utilized to arrive at the range of the possible maximum subsidence at the Crandall Canyon Mine. The methods are: Dunrud's (USGS) equation (discussed in the text below); Boundary Element Method (BEM) using "TABEX-2D" and a Finite Element Mathematical (FEM) simulation using "ANSYS (Appendix 5-6); and the National Coal Board (NCB) of England Technique (Appendix 5-6). The amount of subsidence varies from 3.9', 5.5', 3.34', and 0.25', respectively. Experience at the mine indicates that the 0.25' range of subsidence most accurately represents specific site conditions under room and pillar conditions and the projected maximum of 3.34' under longwall conditions.

The magnitude of vertical subsidence is a function of coal height, overburden depth, stratigraphy, mining technique, and distance from barrier pillars. According to Dunrud's work completed in 1980, based upon a study of subsidence in an underground coal mine at Somerset, Colorado, (USGS 1980), the maximum amount of subsidence expected is equal to 70% of the coal height extracted, (Figure 5-4). The Somerset subsidence curves are included because the overburden characteristics are similar to those encountered at Crandall Canyon and the lack of reported data indicating amounts of subsidence for western underground coal mines.

The maximum subsidence experienced for western coal mines according to Peng, ranges from 33 to 65% and Gentry and Abel cited examples of 70% of the coal height extracted. Thus, to be conservative, a 70% value will be used within this report. The maximum value may be reduced by the amount of coal not recovered in the mining areas, i.e., 20% of the coal is expected to be unrecoverable in the pillared areas at the Crandall Canyon Mine and approximately 12% for the longwall areas. For the areas near an unmined solid pillar the maximum amount of subsidence is reduced (irrespective of the mining method) according to the graph shown in Figure 5-5 based upon work by Gentry and Abel.

The largest magnitude of subsidence that may occur is 3.9 feet at a point 40 feet east of the section line between Sections 5 and 6 and 1522 feet south of the section line between Sections 32 and 5. The values were calculated by reducing the coal heights shown on Plated 5-2 by 20% which represents the unrecoverable coal in the pillared areas (using a six foot coal height), then multiplying by 70% to obtain the maximum possible subsidence value from Figure 5-4 which assumes a worse



case scenario. The subsidence values were reduced according to Figure 5-5 for areas that border a barrier pillar along the perimeter of the lease shown on Plate 5-2.

Horizontal movement which would create slope failure along the escarpment is not expected to occur due to subsidence because only limited coal outcrop occurs within the lease (the east side of the lease area). Within that area of old works no pillar extraction is anticipated.

As with areas in the western part of lease SL-062648 and at the Co-Op's Trail Canyon and Bear Canyon Mines and the Beaver Creek #4 mine, no escarpment failure has occurred. Horizontal movement creating tension or compression cracks can not be projected due to the overburden thickness and lack of jointing density and attitude data along the surface rock exposures.

In addition, GENWAL will second mine no closer than 200 feet to any outcrop (with the exception of portals) and, in accordance with Forest Service Stipulation #20, no mining will be done within a zone that might impact the Joes Valley Fault. This area is determined by a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault was used to project the outer limits of subsidence. Thus, subsidence will not intercept the Joes Valley Fault. If subsidence does occur along the western perimeter, all effects of the subsidence will be maintained within the mining permit boundary. No perennial streams will be affected. On the Dellenbach fee tract mining will not extend closer than 200 feet from the outcrop (other than portals) and no closer than 50 feet from the property boundaries. It should be noted that the mine projections and timing for the Dellenbach tract, and the South Crandall lease and the U-68082 lease mod area are shown on Plate 5-2.

It is accepted practice in this area to use two sources of information for subsidence evaluation. The sources are: 1) "Some Engineering Geologic Factors Controlling Coal Mine Subsidence in Utah and Colorado", Geologic Survey Professional Paper 969, by C. Richard Dunrud, 1976, and 2) "SME Mining Engineering Handbook", Volume 1, by Arthur B. Cummins and Ivan A. Given, 1973. The conclusions based upon the above source material are tempered by on site evaluation and actual experience based on similar mining conditions in late Cretaceous overburdens with similar thicknesses and strengths. The surface area topography within the lease is shown on Plate 3-1, 3-1a, 1-1 and others. The topographic map shows the relative steep sloping sides of the canyons which contains Crandall Canyon Creek, Blind Canyon Creek, and Horse Canyon Creek where rock outcrops are abundant. However, there are few, if any, talus slopes.

#### **5.25.10 Subsidence Control Plan**

The Subsidence Control Plan contained herein addresses specifically those items that are required by R645-301-525 Pertaining to Subsidence. This plan is an amendment to the original application filed on December 17, 1980, by GENWAL the SUBSIDENCE CONTROL PLAN FOR GENWAL COAL COMPANY, INC., as prepared by David A. Skidmore and L. G. Manwaring of Revised 4/05/2003

Coal Systems Inc., on August 28, 1981; and the Mid-term permit revisions dated 5-30-86. The format of the currently approved COAL SYSTEMS report will be used with the conclusions based upon the results of the drilling of the Blind Canyon seam which was obtained in April, 1985, and the Hiawatha seam data obtained to date during mine development. The original application was submitted pursuant to the following: Title 40, Chapter 10, Utah Code Annotated, 1943, as amended, the "Cooperative Agreement between the United States Department of Interior and the State of Utah"; the Surface Mining Control and Reclamation Act (P. L. 95-87); and all regulations promulgated under those Acts affecting mining operation conducted in the State of Utah.

It should be noted that, according to the stipulations of federal lease UTU-78953, there will be no second mining or subsidence under Little Bear Creek within the South Crandall lease area.

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### Surface Features and Facilities Subject to Subsidence.

An examination of the surface area as well as of state, federal, and county records indicate there are no man made structures, utilities right-of-ways and public or private resources necessitating protection from subsidence (Plates 5-12, 5-13, and 5-3) within the mine permit boundaries. In addition, aerial inspection of the permit and adjacent area confirmed the absence of existing man made structures. The occurrence of subsidence will not produce material damage or diminution of value of properties or foreseeable use of lands. Possible effects of mine subsidence on groundwater resources are discussed in Chapter 7. Creeks within the area include Crandall Canyon Creek, Blind Canyon Creek, and the left fork of Horse Canyon. Both forks of Crandall Creek are considered to be perennial at least up to the federal lease boundary with State Lease ML-21568.

The surface in the area is controlled and administered by the United States Forest Service with a small southern parcel of land owned by GENWAL (Plate 2-1). The land is used for domestic grazing in the areas of gentle slope and wildlife habitat and recreation over the total acreage. The vegetative resources will not be negatively impacted by subsidence. Thus, the current land use is expected to continue. Similar mining conditions and practices exist at Beaver Creek #4 Mine and CO-OP's Trail Canyon and Bear Creek mines and no significant loss of vegetation has occurred at those sites.

The Crandall Canyon Mine on the western half of lease SL-062648 has experienced second mining under conditions similar to Huntington Canyon and has not experienced any vegetation change, subsidence or escarpment failure. Visual impact will only be observed in the case of a total escarpment failure. Tension cracks, if any do develop, as viewed from the bottom of the canyons will not be visible and the maximum subsidence of three feet when viewed from below and at a distance of greater than ½ mile will not be visible. As per the USFS, there is no marketable timber in the area of potential subsidence.

Since the original submittal, several operations and construction modifications have been submitted to satisfy regulatory compliance requirements. Consideration was given to the subsidence experienced at nearby mines (CO-OP, Beaver Creek #4) exhibiting similar overburden composition and mining methods, on site inspections at the operating Crandall Canyon, CO-OP and Beaver Creek #4 mines and calculation based upon a generally accepted formulas using limited physical coal strength data in determining coal pillar sizes, barrier pillar design and direction of mining. The aforementioned mines were observed from the surface to note any surface effects from subsidence from pillar mining. No substantial affects from mining have been observed. The Crandall Canyon Mine has pillared coal in areas with as little cover as approximately 200' of overburden. The CO-OP

and Beaver Creek #4 mines have pillared under the same types of escarpments as are located at the Crandall Canyon Mine with no apparent failures.

#### 5.25.11 Methods of Coal Removal

The reserve area will be mined in the room and pillar and longwall methods. These methods are described in Section 5.23 of this chapter.

#### 5.25.12 Description of Physical Conditions

The depth of cover is shown on Figure 6-6. Seam thickness of the Hiawatha coal seam is shown on Plate 6-3. The Bear Canyon and Blind Canyon seam thicknesses are shown on Plates 6-4 and 6-5). Structure of the top of the Hiawatha seam is shown on Figure 5-8. A description of the Lithology of the area is found in appendix 6-6. Other mine progress, interval, subsidence, and lithologic maps within this section and in the mine planning section also address the description of physical conditions.

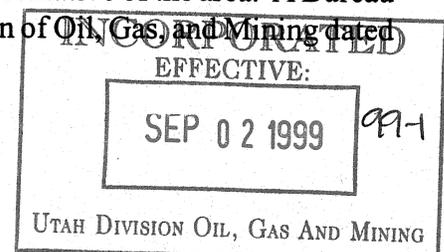
#### 5.25.13 Measures to Prevent Subsidence

In areas where mining may cause undesirable surface movement, steps will be taken to control or prevent subsidence. To prevent subsidence, permanent support can be achieved by selectively mining certain areas, leaving support pillars of coal, and/or by not mining specific areas. Although planned subsidence is not projected outside of the permit area due to the mining of the Hiawatha coal seam within the area of the Crandall Canyon Mine, potential subsidence may occur within areas of retreat mining sections.

The main objectives are to delineate the areas within the lease and adjacent lands that may be affected by subsidence and to determine the extent of the disturbance. Significant guiding design criteria are as follows:

1. Barrier pillars within the lease boundaries left intact to protect adjacent lands.
2. First mining only areas which significantly reduces the potential chances of subsidence.
3. Research indicates that a 20 degree "angle of draw" be used to project maximum extent of subsidence.

A 20 degrees angle-of-draw was used to project a protection area for perennial streams within the mining area. The 20 degree angle was determined by two documents which show this angle of draw to be representative of the area. A Bureau of Land Management letter to the Utah State Division of Oil, Gas, and Mining dated

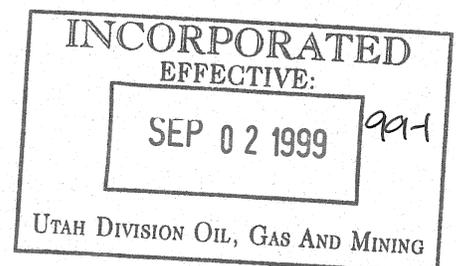


Dec. 11, 1991 states that possible draw angle should be in the 15 to 20 degree range. This conclusion was made on previous history of subsidence occurring in the Wasatch Plateau/Book Cliffs area. This letter is provided as Appendix 5-5.

Appendix 5-6 is a report, "Preliminary Study of Potential Subsidence Over the GENWAL Coal Mine". This report includes subsidence calculations, subsidence history, analysis, and charts with final conclusions showing that there may be a maximum subsidence result of 3 to 4 inches within the boundaries of the leased area, and the angle of draw is expected to be approximately 20 degrees.

4. Protection of perennial streams using only first mining directly under and within a 20 degree angle of draw of the stream. GENWAL recognizes that the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, and the United States Forest Service consider all perennial streams to be important to wildlife. A buffer zone is shown on Plate 5-2 where no subsidence will take place until GENWAL has delineated those reaches which exhibit perennial flow, and shown that mining activity will not adversely effect these stream reaches.
5. Protection of the Joes Valley Fault. As depicted on Plate 6-2, the maximum possible subsidence with respect to a 22 degree angle of draw is within the permit area, As shown on Plate 5-2, Mining Projections, all mining will occur within the permit boundary. No mining will be done within limits that might impact the Joes Valley Fault. In accordance with Forest Service Stipulation #20, a 22 degree angle-of-draw (from vertical) eastward from the surface expression of the Joes Valley Fault was used to project the outer limits of subsidence.
6. There are no plans to backfill any area of the mine with waste material in order to reduce subsidence. In order to delineate the maximum limit of possible subsidence in the vicinity of the Crandall Canyon Mine area, a positive limit (draw) angle of 20 degrees from vertical (70 degrees from horizontal) from the lease boundaries was used. A correction for topographic variability was made in order to accurately determine the maximum surface limit of subsidence. The maximum surface limit of possible subsidence is shown on Plate 6-2. A discussion of the methodology used in determining the maximum limit of subsidence is given in Appendix 5-7. Draw angles of 15 degrees or less have been observed in moderately strong overburdens in the Book Cliffs.

The data contained in Appendix 5-2 were used to determine the potential for subsidence under any perennial streams which may be present within the permit area. Plate 7-16 defines the perennial reaches of Horse and Crandall Canyons, as substantiated by field surveys in 1991 and 1992. Using the data from Plate 7-16 only the lower portions of Crandall Canyon have perennial sections under which first mining may occur.



Overburden thicknesses in the upper perennial reaches of Crandall Canyon have been determine to be about 540 feet. Using a pillar size of 70 x 65 and the worst case analytical condition, the factor of safety has been calculated to be 2.2. The coal outcrops within Blind and Horse (both the north and south forks of Horse Canyon) Canyons are above the perennial portions of the stream. Thus, no subsidence will occur under perennial sections of Horse Canyon (the Blind Canyon drainage is ephemeral).

All state appropriated water within the subsidence zone of the South Crandall lease area is shown on Plates 7-14 and 7-15. Plates 5-2(H) and 5-2(BC) show the mine plan for the South Crandall lease area. Plate 5-2(H) shows the mine plan for the U-68082 lease mod area. These maps depict which areas will be longwalled (full extraction) and which areas will be developed as first-mining only. Subsidence Survey Letters of Notification to surface owners and water conservancy districts are included in Appendix 5-25.

The following state appropriated waters are located within the subsidence zone: 93-383, 93-381, 93-483, 93-191, 93-190 and 93-1180. Information about quality, quantity, and ownership of these waters can be found in Chapter 7, Table 7-6, and in Appendix 7-1.

#### **5.25.14 Subsidence Monitoring**

The applicant commits to implement the proposed subsidence control plan and applicant hereby incorporates the same into this submittal. An aerial monitoring system for the Crandall Canyon Mine which has been accepted for implementation and vertical and horizontal control have been established using ground control stations, shown on Plate 5-5. (The program is included as Appendix 5-8). Baseline flight lines were flown over Sections 31 and 32 of T15S R9E, Sections 5 and 6 T16S R7E, Sections 1 and 2 T16S R6E, and Sections 35 and 36 T15S R6E in October of 1989. Selected portions and/or all of Sections 34, 35, and 36 T15S R6E and Sections 2 and 3 T16S R6E (Plate 5-5) will be included in the 1995 Fall Survey to ensure that all projected mined areas within LBA#9 are included in the subsidence monitoring program. Control points within and adjacent to the leased area (including the South Crandall lease area) have been established and located by surveying practices. Prior to mining the area was photographed and a pin map was generated.

Aerial surveys will be conducted by GENWAL each year for the areas above and within the 20 degree angle of draw of the actual mined area. Based on a written request by the Forest Service, GENWAL is revising the subsidence monitoring plan. Monitoring will now be conducted annually until subsidence of less than one foot has been measured for three consecutive surveys showing that subsidence is substantially complete.

The following information will be forwarded to the Division on an annual basis when it becomes available:

1. A current map of the underground workings with areas delineated as to where the second mining will begin.
2. The approximate dates when second mining will commence and terminate.
3. The date of monitoring.
4. The vertical and horizontal positions of all monitoring points and pins, directly over and within the 20 degree angle of draw to the mined area, surveyed by aerial photography for that specific year.

There was and has been no evidence of escarpment subsidence or failure. There are no further plans to monitor escarpments in the area not visible from Huntington or Crandall Canyons. The subsidence/escarpment survey results were recorded and submitted to the appropriate regulatory authority. No escarpment failure occurred.

#### **5.25.15 Anticipated Effects of Planned Subsidence**

If subsidence does occur, surface effects may include minimal ground lowering and temporary tensional fractures at the margins of the subsided area. Any subsidence occurring on the 160 acre Dellenbach fee tract should have minimal effects on the surface. There are no escarpments, raptor nests, archeology site, streams or springs located the Dellenbach tract. This tract (surface and underground) is privately owned by Genwal Resources Inc. The tract is within the presently approved permit area and is included in the current subsidence monitoring plan.

Subsidence monitoring for the South Crandall lease area and the U-68082 lease mod area will be done according to the existing plan approved for the Crandall Canyon mine. Pre-subsidence base-line aerial surveys have been completed and the initial survey control monuments have been installed on the ground. Additional control points (monuments) will be installed as mining progresses. (Refer to Plates 5-2 for the location of the existing and future monuments.)

In much of the area of the South Crandall lease area, both the Hiawatha and the Blind Canyon seams are proposed for full extraction longwall mining. In these areas the combined thickness of both seams ranges upward to about 12 feet. If surface subsidence in these areas is 80% of total mined seam thickness, then it may be possible to see nearly 10 feet of subsidence in some areas of the lease after mining. It should be noted that the Forest Service and BLM have imposed a special stipulation in the South Crandall federal lease specifically to provide additional protection to the Little Bear spring system. These lease stipulations prohibit full-extraction mining in the following areas;

- a) area under the Little Bear stream channel with less than 600' of overburden.
- b) area within 1000' of the southeast corner of the lease (to protect the Mill Fork graben.)
- c) area within 1000' of southern boundary of lease (to protect possible water-bearing fracture system.)

GENWAL personnel will conduct a surface inspection of all areas where subsidence has occurred no sooner than 6 months but no later than 12 months after extraction mining has occurred.

Multiple seam mining beyond spring site LB-7 in Little Bear Canyon is contingent upon a monitoring plan approved by the Division in concurrence with the Forest Service at least two years prior to mining in that area.

### 5.25.16 Mitigation of Damages

As previously presented within this chapter, no material damage or diminution of value or foreseeable use of lands is expected to occur. GENWAL has been in consultation with the BLM and received their concurrence with the conclusions presented in this document, a copy of the BLM correspondence may be found in Appendix 5-5. Displacement of wildlife due to subsidence may be minimal. However, springs within the potential subsidence limit are a significant resource to the local wildlife and may be impacted.

Seeps and springs within the possible subsidence limit emit water from the North Horn Formation, Price River Formation, Blackhawk Formation, and the Castlegate Sandstone. A limited number of seeps and springs are found to issue from the Blackhawk Formation and Castlegate Sandstone units within the area of possible subsidence limits. These seeps and springs show only limited use by deer and elk. Subsidence from mining in these areas will have minimal impacts on water supplies from seeps and springs in the vicinity of the mine. Water monitoring and the Probable Hydrologic Consequences are discussed in detail in Chapter 7 of this permit.

Seeps and springs within the possible subsidence limit of mining emit water from the North Horn and Price River Formations 100 to 2100 feet (10 to 210 times the coal bed thickness) above the interval to be mined. If repeated subsidence via roof failure occurs, elastic deflation is believed to occur at a distance of nine coal seam thicknesses (90 feet) above the coal. If any tension cracks do develop, they should be sealed by clay migration occurring during elastic deformation. As a result, these seeps and springs should not be affected by subsidence. However, monitoring will be conducted as described in Chapter 7.

GENWAL recognizes the fact that the Division of Wildlife Resources, the Division of Oil, Gas, and Mining and the USFS consider all seeps and springs to be important to wildlife. If, during the monitoring of the springs, non-climatic diminutions of flow from any seep or spring in the area are substantiated, GENWAL will notify the Division of Wildlife Resources, the Division of Oil, Gas, and Mining, the State Engineer and the U. S. Forest Service. If documentation concludes that mining efforts at the Crandall Canyon Mine have reduced or eliminated the flow from the seeps and springs, then acceptable remedial action plans will be submitted for approval and subsequently installed.

In the event subsidence negatively impacts grazing, the applicant will compensate the owner or appropriate the party by paying the fair market value for the loss experienced. Compensation will be made after the grazing loss is proven to have resulted from surface subsidence related to the operation of the Crandall Canyon Mine.

Should any structures such as roads, bridges, etc., be adversely impacted as a direct result of subsidence directly related to the operation of the Crandall Canyon Mine, the operator will repair or replace the structure, whichever is more economical.

Mitigation for potential disruption to the Little Bear Spring will be accomplished through the construction of a water treatment plant which will provide replacement water for the spring if mining activity in the South Crandall lease area affects the quality or quantity of the spring. Construction of this water treatment plant will be done under the provisions of a water replacement agreement between GENWAL Resources, Inc. and the Castle Valley Special Service District who maintain culinary water rights to Little Bear Springs. A copy of this water replacement agreement is included in Appendix 7-51.

Subsidence projections for the South Crandall lease area are depicted on Plates 5-2(H) and 5-2 (BC). Subsidence projections for the U-68082 lease mod area are shown on Plate 5-2(H).

The powerline that crosses the South Crandall lease was built by GENWAL to serve the Crandall Canyon mine. There are no other users on this line. This powerline follows the highline of the ridge and is more than 1500' above the coal seam to be extracted. Due to the depth of cover no damage to this powerline is expected due to subsidence. As full extraction mining approaches under the powerline GENWAL will monitor the situation to ensure that the potential for damage to the powerline is minimized. Most of the powerline within the subsidence zone is visible from the Genwal mine and can be inspected by mine personnel. The section of line on the ridge will be inspected during annual subsidence monitoring. Much of this line utilizes double pole X-braced structures which are inherently stable in design. This line is equipped with ground fault protection which will automatically and instantly de-energize the line in the event of any damage, including grounding, and/or short-circuiting. Vegetation has been cleared on either side of the powerline within the right-of-way. The powerline runs over the area that was mined out by the ARCO #4 mine, and there was no resulting damage. If any damage occurs GENWAL will be out of power and will immediately make arrangements for any necessary repairs.

It shall be noted that the extent of possible subsidence in the U-68082 lease mod area is difficult to predict because the extent of mining in this area is extremely speculative due to the low coal (5' and less) in this area. However, in keeping with special lease stipulation #1 (see Appendix 1-15A, Attachment 3) there will be no second mining (and hence no subsidence) in any areas where the cover is less than 50 times the seam height plus 50', or approximately 300' overburden. A detailed discussion of this stipulation can be found in Appendix 3-20, (Final Environmental Assessment, Modification of Federal Coal Lease UTU-68082, U.S. Forest Service.)

GENWAL has discussed the powerline situation with officials of Utah Power & Light (Dale Robertson, transmission and Distribution; Greg Bean, System Engineering; and Aaron Gibson, Customer Service Representative, verbal communication February 8, 2005). These representatives are very familiar with the surface effects of full extraction longwall mining and are in agreement that the risk to this line is quite minimal. GENWAL commits to immediately notify the Forest Service in the event of any damage to the powerline so that proper fire prevention measures can be implemented as required.

### **5.25.20 Subsidence Control**

GENWAL will comply with all provisions of the approved subsidence control plan and will correct any material damage resulting from subsidence to surface lands as a direct result of the operation of the Crandall Canyon Mine. This will be done to the extent technically and economically feasible, by restoring the land to a condition capable of maintaining the value and reasonably foreseeable uses which it was capable of supporting before subsidence.

The mine plan is designed so that mining will not result in material damage to perennial streams or impoundments having a storage volume of 20 acre feet, or which could result in environmental degradation or safety hazards to streams and associated structures.

### **5.25.30 Public Notice of Proposed Mining**

At least six months prior to mining, or within that period if approved by the Division, all owners and occupants of surface property will be notified, by mail, identifying specific areas in which mining will take place, dates that specific areas will be undermined, and the location or locations where the operator's subsidence control plan may be examined.

### **5.26 Mine Facilities**

The existing surface facilities were partially located in a predisturbed area and the only area where the coal outcropped in the lease area. The existing surface facilities are located in a very limited disturbed area. The culvert expansion project adds the minimally necessary area for additional and improved facilities. The use of a 72" diameter culvert, through which Crandall Creek is routed, is the primary feature used to minimizing the disturbed area within the steeply sloped canyon. See Plate 5-3 for the surface layout and Plates 3-7, 3-8, and 3-9 and 5-20 for the premining land configuration.

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A construction sequence for the culvert expansion project is included in Appendix 7-50.

The new facilities will incorporate several design features which will minimize the spread of coal fines and dust compared to the existing facility.

1) With the new system, all coal will be reclaimed by underground feeders located in the reclaim tunnel below the coal pile. During normal operations, coal will not have to be handled by heavy equipment (i.e. dozers and loaders) as with the existing facility.

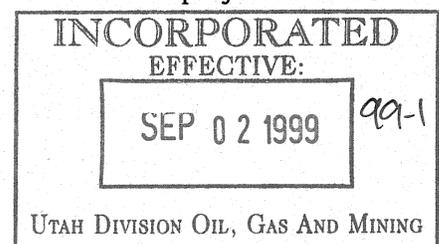
2) The new coal pile will be contained by the hillside on the south, the new upper mine pad on the west, and the new road extension on the north. This containment will help prevent the pile from spreading. Concrete road barricades (Jersey Barriers) will be placed along the outside edge of the road from the new truck turnaround to the new loadout and beyond which will further limit the spread of coal and coal fines onto the roadway. This new pile configuration is in contrast to the existing design wherein the coal pile is located immediately adjacent to the road and migration of coal onto the roadway is not uncommon especially where mobile equipment is constantly working the pile during the loading and reclaim process.

3) The new truck loadout will be constructed outside of the road alignment in contrast to the existing facility where the loadout is situated directly within the roadway. Because the new loadout will be a state-of-the-art computer controlled facility, coal spills will be minimal compared to the existing facility. However, what little coal spillage that may occur with the new system will be cleaned up immediately and coal fines will report directly to the new sediment pond without being swept across the roadway as is now the case with the existing facility. With the new facility, the coal pile, crusher facility and loadout will all be located on the same side as the sediment pond and away from the existing roadway.

A Forest Service road use permit was obtained from the United States Forest Service, Manti-La Sal National Forest, Price, Utah in order to upgrade, use, and maintain the road to the mine permit area. This Forest Development road does not lie within the permit area and is not included as part of this permit application. The Forest Service road that lies within the disturbed area boundaries is included in the permit area for the purpose of drainage control.

The topsoil was stripped according to the plan, stockpile, and seeded with the topsoil stockpile seed mix. The topsoil stockpiles are protected from encroachment by placing earthen berms, straw bails, silt fences, or equivalent where needed.

There are no pre-existing structures or facilities located within the permit area. GENWAL has constructed a metal building (80' x 40') that is used as an outside shop. A new warehouse and office complex (50' x 25') has been built east of and connected to the existing shop. An additional 30' x 20' shop bay has been approved for construction by the Division and is projected to be constructed in the future.



During the summer of 1990, a power line from Utah Power & Light was brought in across the top of the canyon. At this time the use of the diesel generator was terminated. Presently, a state of the art substation and transformer provide all power needs. The high voltage lines from the substation to the mine are run underground in cement covered conduit thus eliminating the need of overhead power poles and transmission lines.

The oil storage and fuel containment area (80' x 20') is located at the west end of the old loadout area. This containment area is of sufficient volume to hold the volume of the largest storage tank found within the containment area plus any additional storm water. The containment area has a valve connected to the drain inside the wall. The valve and drain will provide a means for removing any spills or water in the containment area. A certified SPCC plan outlining emergency action as per R645-301-730 is available at the mine site (Appendix 5-10). Refer to Plate 5-3 for all surface buildings and structures. A fuel storage area will be located in the coal storage yard for fueling coal handling equipment. This will eliminate the need to cross truck traffic for refueling. The diesel fuel tank will be 11 feet long and 4 feet in diameter. A containment structure for the tank will be 6 feet wide, 12 feet long and will have walls 2 feet high. This containment will be able to retain the contents of the tank should it leak or rupture. See Map 5-3 for the location of this refueling area.

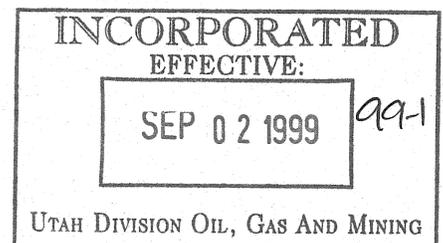
An underground bathhouse has been constructed to provide shower and sanitary facilities for the miners. This underground bathhouse was designed and installed in accordance with all State Health, MSHA, and Forest Service regulations. These agencies were contacted prior to the design and implementation for their input and approval as necessary. The water and sewage plans can be found in Appendix 5-11 and 5-12, respectively.

Two mine fans located on the surface, as shown on Plate 5-3, are used to ventilate the mine workings to insure a sufficient amount of oxygen for mine employees to continue operations within the mine. Other structures such as cement guard rails and cement walls have been constructed, with the Division's approval, and are listed within pages 5-33 and 5-34. This list includes the approximate date of completion of each structure and the description of each construction project.

Shotcrete was sprayed onto the cut-slope above the portals, the portal roads, and the coal storage area, as shown on Plate 5-3. A 4" square wire mesh was used, being spaced approximately 1" to 2" away from the existing slope. The wire mesh was secured to the slope with standard metal clips and bolts. Two-inch PVC pipe, perforated for drainage, was inset 2 to 3 feet into the slope at two different elevations, approximately 6" to 12" from the bottom of the project and 12" to 24" from the top of the project. These pipes were spaced 6 to 10 feet apart for the entire length of the project, with 2" to 4" of shotcrete then being sprayed onto the wire mesh. The intent of the project is to stabilize the cut slope to eliminate sloughage and enhance safety for personal.

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### Specifications for Shotcreting Cut Slopes

Average slope:	1/3:1
Matting:	11 gauge 2" x 4" or 9 gauge 4" x 4" wire mesh 6' wide x full length of slope
Securement:	5/8" x 24" long bolts w/ plates or 3/4" x 24" long rebar type anchors w/ plates
Drainage:	2" PVC pipe, 24" long, perforated, located at top and bottom of slope, 6' to 10' on centers. Pipes will be inset into the slope with the end extending outside the shotcrete. Drainage of the slope will be collected by the 2" PVC pipes and allowed to flow to the outside of the shotcrete.
Shotcrete: (per batch)	1800 lbs sand 800 lbs pea gravel 425 lbs cement 400 lbs fly ash
Application:	Applied with a Reed Sova III or Reed M40 pump w/ accelerator. Minimum thickness applied 2"

See Figure 5-10 for a cross sectional detail of shotcrete application.

This MRP covers the expansion of the surface facilities as shown on Plate 5-3. It should be noted that this represents the initial phase of the Crandall Canyon mine surface improvement. As shown, surface improvements will include a new intake portal, a new belt conveyor portal and a new fan portal.

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The new portals will be constructed along the south side of the upper pad of the existing mine-yard (refer to Plate 5-3). This area is presently serving as the parking lot and material storage yard. The new portals will consist of an intake portal, a fan portal, and a belt portal. The intake portal will be used to accommodate fresh air intake into the mine, and also to provide primary travel access into the mine for employees and materials. The fan portal will support a ventilation fan which will suck return ventilation air out of the mine. The belt entry will be located south of the existing coal pile and will contain the main conveyor belt hauling coal out of the mine.

Construction of the portals will be done within the existing permitted disturbed area boundary. The existing disturbed area boundary will not be increased. The existing sediment pond has been sized to accommodate this new portal construction area, so no changes to the sediment pond will be required. Except for adding a new culvert under the access ramp to the new portal, none of the previously approved and existing surface drainage structures will be affected.

In the area of the new south portals, the base of the coal seam is located approximately 17' above (i.e., higher than) the level of the existing mine-yard. An earthen ramp will be constructed on the existing pad to gain access up to the level of the coal seam. In the area of the intake and fan portals, the existing hill slope will be excavated with a back-hoe to expose the coal seam in preparation for construction of the portal canopies. A small elevated pad will also be constructed in front of the fan portal on which the mine fan can later be installed. This fan pad will be constructed as a continuation of the access ramp leading to the intake portal. The access ramp to the intake portal and the fan pad will be constructed partially using the earthen material generated in the process of facing up the coal seam and partially using fill material hauled in from an off-site borrow source. The imported fill material will come from the same source (i.e., the same borrow pit) that supplied the pad material for the recently completed surface expansion. This borrow site would be the Nielson Construction commercial borrow pit located in Huntington Canyon below the power plant. As the access ramp is being constructed a new culvert (C-11A) will be added to handle sheet flow drainage from the upper material yard (see Plate 7-5).

As the access ramp and fan pad are constructed from the existing yard surface up to the level of the coal seam outcrop, some of the new fill material will be placed up against the intervening existing undisturbed slope. Part of the access ramp/fan pad will therefore be constructed on top of the existing slope. Before this ramp/pad is constructed, topsoil along the existing slope below the fan pad and access ramp will be protected in-place using a geotextile cover placed along the undisturbed slope under the fill material. This topsoil protection technique would be identical to the approved method used during construction of the existing surface expansion facilities (Phase I surface expansion).

After the access ramp and fan pad have been constructed (and the underlying in-place topsoil protected with geotextile), the portal excavation can begin. Prior to starting the portal cuts, the existing topsoil at the portal sites will first be salvaged. Topsoil conditions along the south slope  
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portal area is similar to the conditions at the adjacent coal pile area where topsoil was salvaged during August, 1998. This topsoil salvage effort is described in appendix 2-5, Part II, prepared by Pat Johnson, soil scientist. At that area, according to Ms. Johnson's report, the depth of true topsoil was 3" but an average of 8" - 9" of material was taken due to the operating nature of the backhoes which were employed in the salvage process. In addition, an intensive soil inventory and site investigation was performed on the south slope on August 18, 1998 and is included in Appendix 2-6.

In order to minimize the area of additional disturbance associated with the construction of the south portals these portals will be constructed by excavating individual pockets into the hillside for each portal rather than along a common highwall. Topsoil has already been removed from the belt portal site. By utilizing individual pocket cuts for the portals the total area of new disturbance is expected to be less than 4500 sq. ft. (0.11 acres). Topsoil will be removed from the areas of the south portal pocket cuts prior to excavation as described in Section 2.31.1. According to the Nyenhuis survey, the upper two feet (24 inches) is suitable for salvage. Based on the Nyenhuis soil survey it is anticipated that approximately 9000 cu. ft. (333 yds.) of topsoil will be salvaged from the intake and fan portal cuts.

The salvaged topsoil will be stored on the existing topsoil pile #4 located off-site at the bottom of Crandall Canyon. This topsoil pile is constructed on Forest Service land under a Special Use Permit issued on 8/17/87. This pile #4 was originally constructed in 1997 during Phase 1 of the surface facility expansion. At that time it was designed and constructed sufficiently large to accommodate the additional topsoil storage requirements for the Phase 2 south portal construction. The Forest Service has concurred with the addition of the south portal topsoil to this pile. All topsoil removal, salvage and storage will be over-seen, directed and monitored by an independent soils scientist approved by the Division. A report of the topsoil salvage operation will be prepared by the soil scientist and added to the MRP upon completion as Appendix 2-5, Part III.

After the portal sites have been faced up construction of the portal canopies will begin. These canopies will be constructed from 6" steel I-beams and 1/4" steel plate according to the MSHA guidelines. These canopies will measure approximately 8' high by 20' wide and will extend underground as far as needed to insure adequate roof protection. The canopies will be anchored to concrete footers. These canopies will provide a safe structure from which the miners can begin driving the entries back into the coal seam. These portal canopies will be similar to the existing portal canopies. After the intake and fan entries have been driven into the hillside and connected together underground with a cross-cut, work can then be started on construction of the mine fan installation. The fan will be an 8' diameter Spendrup or Joy axial vane (or equivalent) electric powered fan. It will not have a diesel powered back up. It will be mounted on concrete foundations located on the newly constructed fan pad. The fan installation will be very similar to the existing fan structure. While the fan is being installed, the miners will drive the belt entry from inside the mine out to the belt portal. During this phase of development, mined coal will be moved away from the surface with a front-end loader, a mobile radial stacker, or some other temporary means of conveyance. After the belt portal connection is completed, a new conveyor truss will be

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installed from a concrete landing at the belt portal out to the existing coal pile. The conveyor will be 48" wide, supported on a steel box truss which will extend from the new portal to the existing stacking tube. An intermediate bent support may be required, depending on final engineering. If this bent is required it will be anchored to a concrete foundation constructed on the existing coal pad. The conveyor will be covered to minimize fugitive dust. The air quality permit will be revised prior to construction to include the new conveyor (see Appendix 5-23). This truss/bent structure will be similar to the existing truss/bent structure, but only one fourth as long. All coal from the mine will then be delivered directly to the existing coal pile and will be crushed and loaded on trucks through the existing coal handling facilities.

The access ramp leading into the portals will be approximately 100' long and 20' wide. It will have jersey barrier guards along both sides. The ramp will be constructed from the imported fill material, laid down in 12" - 18" lifts, and compacted to 90%. The only vehicles using the ramp will be underground mine vehicles going in and out of the mine. Therefore the ramp is not considered a road. Drainage from the ramp will be handled by the existing drainage structures and the new culvert (C-11A) as shown on Plate 7-5. It is estimated that approximately 3500 cubic yards of fill will be needed to construct the access ramp/fan pad. This quantity will be verified after construction on the as-built plans.

Power, water, communications, and other mine infrastructure will be supplied to the south portals as an extension of the pre-existing Crandall Canyon Mine facilities.

Figure 5-11 depicts a typical cross-section through the south portals, showing the pocket cut, access ramp, in-situ soil geotextile protection, and the portal canopy construction.

Figure 5-12 depicts a typical cross section along the south portal conveyor belt structure.

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GENWAL is also considering a second possible option for constructing the south portal intake and fan portals. Instead of constructing a ramp up to the level of the coal seam, short tunnels would be driven from the existing yard level up to the coal seam. In this scenario the pocket cuts would be made into the hillside lower down at the same level as the existing pad. This level is approximately 15' below the base of the coal seam. Since the coal seam sits directly on top of the Star Point Sandstone, this sandstone out-crops at the existing yard level. Tunneling would begin in the sandstone and ramp up underground to the coal seam.

If the tunnels are driven at an incline of 10% they will be about 160' long to where they intersect the base of the coal seam. At 8' high and 20' wide, excavation of the two tunnels (intake and fan) would generate approximately 1900 cu yds. of material during construction. This tunnel excavation material will consist of sandstone mixed with coal. This excess material would be disposed of by placing it in a 6' deep layer along the existing fill bank located between the upper material yard and the coal storage pad. This embankment is part of the designated coal storage area and currently is covered with coal. Therefore, after the tunnel excavation material is layered onto the embankment, it too will be covered over by the active coal pile for the remaining life of the mine. Refer to Figure 13-a and 5-13b for more details of this tunneling construction option.

Upon final reclamation the tunnel excavation material would be hauled back into the mine tunnels where it would be sealed up prior to backfilling the portals. Backfilling and reclamation of the portal pocket cuts would be the same regardless of whether the ramp or tunnel option is selected. If GENWAL elects the tunnel construction option, topsoil will be salvaged in exactly the same manner as described previously. The amount of topsoil salvaged, stored and redistributed would be the same regardless. If the tunnel option is selected, there would be no additional in-place topsoil required to be protected with geotextile, because there would be no fill material placed up against the hillside.

If this option is selected, GENWAL commits to ensuring the protection of the hydrologic balance for surface and groundwater systems as required by R645-301-731. The tunnel excavation material will be tested for acid- and toxic-forming material and the analytical results of this testing will be presented to the Division. The hydrologic balance will be protected in the following manner.

- a) The excavation material will consist of fragmented Star Point sandstone. This sandstone outcrops naturally in the minesite area and is one of the major geological features which determine the character of Crandall Canyon and many other canyons in the Wasatch Plateau. This predominant sandstone is not known to be acid- or toxic-forming anywhere in the Utah coalfields. However, further site-specific testing of the sandstone will be conducted prior to any construction.

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- b) The proposed location of the material storage is on top of the existing pad fill. Any runoff from this area would report to the existing sediment pond.
- c) The existing pad fill in the proposed storage area varies between 10' and 40' thick over the bypass culvert and is densely compacted. This thickness of compacted fill material is sufficient to preclude any leaching downward into the bypass culvert or groundwater.

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### 5.26.10 Coal Handling

Coal exits the mine on a 48" conveyor belt, is transferred onto 48" overhead conveyor belt and drops into the run of mine coal stockpile. The coal is reclaimed from the stockpile and is conveyed to crusher station. Crushed coal is then conveyed directly to the silo. From the silo, it is weighed and loaded into coal trucks.

An automated coal processing facility has been installed at the GENWAL mine site. The facility, as-built layout, can be found on Plate 5-6. Design calculations are located in Appendix 5-13.

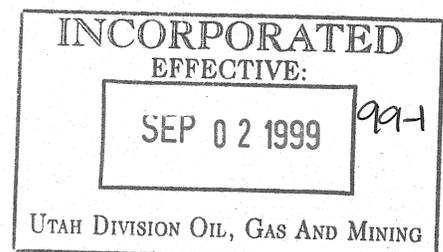
Coal from the mine is delivered to a concrete stacking tube. This structure will support a nominal 30,000 ton storage pile. The coal is reclaimed from the pile through an underpile drawdown system designed to feed a reclaim conveyor. Reclaimed coal is screened and crushed to a 2 x 0 product, then transported to a computer-operated batch-weight truck loadout facility. From there it is loaded into the trucks and transported off the minesite to market. The new surface facilities has been painted a neutral gray color to blend with the existing environment with minimal visual obtrusiveness.

After the new facilities are operational, the old loadout facilities were completely dismantled and removed from the site. The truck scales were also removed and the road repaved and re-established as a two lane road meeting Forest Service standards. Coal and coal debris will be cleaned from the loadout area and from around the existing retaining wall area. The rehabilitated loadout site will be used for storage of snow and/or road traction material in the winter time and other suitable storage needs in the summer time. A slotted culvert has been installed on the roadway below this storage area. The slotted drain will direct any road runoff and material tracked down the road into the sediment pond for treatment.

### 5.26.12 Power System, Transmission Lines, Substations, Feeders

Power for the mine, both underground and surface use, is provided by transmission lines from Utah Power, and Light. The substation and transformer built by PEMCO provides 7200 volts to surface and underground power centers. The power lines run in underground cement covered conduit from the substation to a visual disconnect located by the bathhouse portal. From the visual disconnect it travels through 4" steel conduit into the mine. All electrical installations meet the appropriate 30 CFR Part 75 and 77 MSHA regulations. The placement of electrical installations can be found on Plate 5-3. Plate 5-8 gives a detailed layout of the substation and transformer facility.

Utility poles located on the surface will be constructed to protect raptors, all wires will be insulated and there will be no exposed conductors. All electrical installations will be done in accordance with MSHA regulations.



### 5.26.13 Surface Equipment

Underground supply equipment will be used on the surface as needed. The following is a list of equipment used exclusively on the surface:

Fork Lift  
Pick-up Trucks  
Dozer

Snow Plow  
Diesel Tractors

Front End Loader  
Bobcat tractor

### 5.26.14 Culinary Water System

The culinary water used at the mine is purchased from a vendor who is supplied from a state approved water system, or taken from the deep well (MW-1) located at the mine portals. This deep well has been installed in accordance with state health regulations for culinary use. The culinary water is placed in containers designed for this purpose. Drinking water at the mine is provided as bottled water.

The water used underground is placed in the mine sumps located underground. The location of the sumps will change as mining progresses across the reserve and will not remain in any one area permanently.

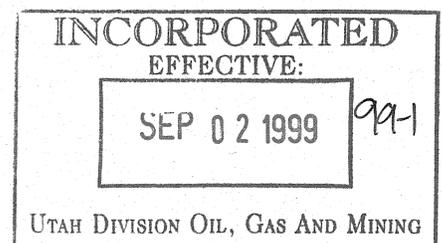
### 5.26.15 Sewage System

The bathhouse, located underground, and a new proposed bathhouse for the culvert expansion project is designed and constructed in accordance with the State Health Department's rules and regulations. The sewage will be contained in a concrete holding tank and pumped by a licensed contractor and disposed of at a State approved sewage treatment plant. The sanitary facilities underground will comply with all MSHA regulations. The sewage facility can be found in Appendix 5-12.

### 5.26.16 Sedimentation Control Structures and Water Treatment Facilities

The existing sedimentation pond was reconstructed during the 1986 and 1989 construction seasons and enlarged during the culvert expansion project in accordance with R645-301-526.300, as detailed in the Runoff and Sediment Control Plan located in Chapter 7.

Underground sumps will be built in order to effectively treat underground water before discharging into Crandall Creek, refer to Plate 5-4 for the sump locations. All discharge into the creek will meet effluent limitations of the UPDES permit and monitored in accordance with that permit, (Appendix 5-14). The sediment pond and the underground sumps are the only water treatment facilities proposed at the mine site.



### 5.26.21 Utility Installation and Protection

All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells; oil, gas, and coal slurry pipelines, railroads; public utilities; etc. which pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division.

### 5.26.22 Operation of Support Facilities

Support facilities will be operated in accordance with a permit issued for the mine to which it is incident or from which its operation results.

### 5.26.3 Water Pollution Control

See "Waste Disposal Plans" under the Mining Operation section of this chapter.

### 5.26.4 Air Pollution Control

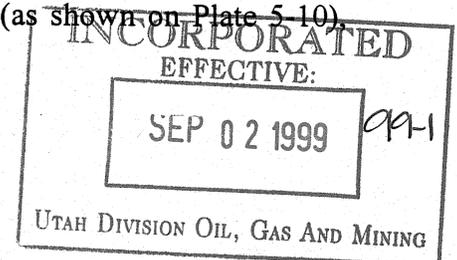
Coal mining and reclamation activities will be conducted in accordance with R645-301-420 and the Air Quality Approval Order issued by the Utah Division of Air Quality (Appendix 4-7).

## 5.27 Transportation Facilities

The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 45 ton tandem trailer coal haulers used in the Utah coal fields. GENWAL uses a loading site on the Utah Railway located at Mohrland, Utah, a loading facility on the Southern Pacific Railway in Wellington, Utah, and other independently owned loadouts within the Carbon/Emery county area.

The Forest Development Road from Huntington Creek to the truck turn around area was constructed under the definition of a class one road and will be maintained as a primary road, in compliance with the road use permit issued by the U. S. Forest Service, Manti-La Sal National Forest. The forest access road will remain as part of the post mining land use in accordance with the Forest Service Permit (Appendix 1-2). The Forest Service Access Road, upgraded under the definition of a class two road, is maintained as a primary road. The road connects the main pad area, the truck turn around area, and the Forest Service Parking/Turnaround to the Huntington Canyon Road (State Route 31). The road is designed, maintained and will be restored in accordance with the Forest Service road use permit.

The road from the lower pad area to the upper pad area was built under the definition of a class two road and is maintained as a primary road. It is designed (as shown on Plate 5-10).



maintained and restored in accordance with R645-301-527.120. The Ancillary road to the portal area was built under the definition of a class three road and was designed (as Shown on Plate 5-10), is maintained and restored in accordance with R645-527.130.

The Forest Service Development road has been designed and was approved by the USFS prior to construction. The design drawings are on file with the Manti-La Sal National Forest in Price, Utah. During the 1991 construction season GENWAL Resources Inc. improved and asphalted the Forest Service Development road and surface facilities area of the Crandall Canyon Mine (as shown on Plate 5-3). The improvement information covering the haul road and facilities area is addressed in Appendices 5-15, 5-16, and 5-17.

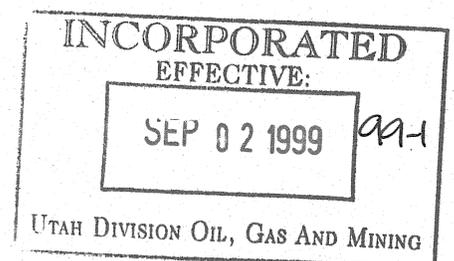
The Forest Service road (primary road) is utilized by coal haul trucks, mining equipment (on a limited basis), support vehicles, employees, and recreational users (public). The two roads located on the permit area, the portal pad road and the access road to the main pad, are utilized by both surface and underground mining equipment, support vehicles, and employee vehicles. The ancillary road to the portal area is utilized by service vehicles on a very limited basis. The ancillary road to the upper unused area has been reseeded.

The forest parking area past the mine site was preserved for recreational/forest service parking and with verbal approval for the short term storage or mine equipment being unloaded/offloaded or moved as a part of upgrading or retrofitting.

Because of the limited space available at the existing site, snow removal and storage is now a problem. Currently, under agreement with the Forest Service, limited snow storage is allowed in the Forest Service trailhead parking area. This practice is less than ideal however. Snow storage in this area limits the amount of available public parking. Snow melt and runoff from the snowpiles often makes the parking area muddy in the springtime and makes sediment control into nearby Crandall Creek more challenging. The expanded operations area should relieve congestion at the site and free up both the parking area and the Forest Service road and make snow storage in the parking area unnecessary. Snow storage will become available in the area of the existing loadout facilities once these facilities have been removed and the area cleaned up properly as part of the overall site expansion project. Snowmelt from this new storage area will be able to report directly to the sediment pond located nearby. There will be absolutely no snow storage in the sediment pond itself.

After construction of the surface expansion is completed, the Forest Development Road 50248 will be returned to double lane width through the permit area to the Forest Service trailhead parking area. This will be accomplished by the following:

a) The existing loadout facilities will be removed and cleaned up and the road will be widened, realigned, and repaved through this area.



b) The existing truckscales and exit ramp will be removed from the middle of the road and the roadway will be re-established and repaved in this area.

c) The existing oil storage shed will be rehabilitated and the roadway will be regraded and repaved in this area. This storage facility has been designed and constructed to adequately contain the volume of the largest storage tank plus the additional volume of any direct precipitation which may accumulated within the containment area.

d) The existing roadway from the loadout up to the truck turnaround area will be widened by approximately 15 feet. This will result in an additional (third) lane which can be used by the trucks as a stacking lane as they wait to enter the loadout to be loaded. This will free up the existing road for unobstructed two-way, two lane traffic to facilitate public use of the road for Forest related activities.

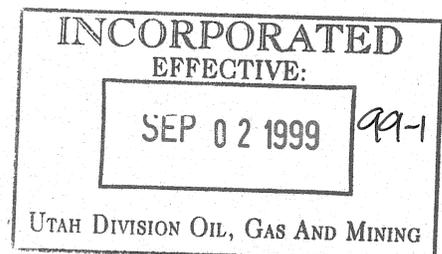
e) The turn-around area will also be widened to allow the trucks to turn in a standard counter-clockwise direction and thereby eliminate the present practice of clockwise cross traffic turnarounds.

f) Construction of the high speed, high efficiency truck loadout will in and of itself help minimize the congested conditions which now exist within the mine site. Presently trucks are often forced to stop along the Forest Service road while waiting to be loaded. The expanded coal storage capabilities and the new high-speed truck loading facilities will allow the trucks to be loaded in a continuous, uninterrupted basis, thereby eliminating the major cause of tie-ups and congestion.

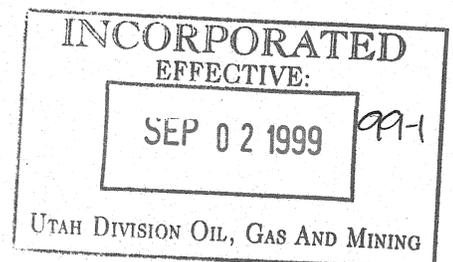
g) After the Forest Service road has been re-established, (i.e. realigned and repaved) the roadway will be striped to properly delineate the travelway through the mine site areas to the Forest Service Trailhead. The travel lanes will be clearly marked to help separate public traffic on the road from truck traffic associated with the coal operations. Signs will also be installed to direct the public to the trailhead and to instruct the public as to which areas within the minesite should be avoided in order to prevent conflicts with the ongoing operations. These direction signs will be readily visible to the motoring public and will conform to the Manual of Uniform Traffic Control Devices .

The plan view for roads may be found on Plate 5-3. The typical cross section for each road and their corresponding profile may be found on Plate 5-10.

The coal trucks exit to the east of the loadout facility and onto the USFS road (see Plate 5-3). Roads in the permit area are inspected in order to determine the maintenance required to minimize and correct erosion problems before they become extensive. Maintenance will be performed as required to control erosion. This maintenance will include maintaining the ditches, resurfacing when needed and maintaining proper drainage.



See Plates 5-3, 5-10, 5-19, and Appendix 1-2 for more sections and details of the roads within the permitted boundaries. If a road is damaged by a catastrophic event, such as a flood or earthquake, it will be repaired as soon as practical after the damage has occurred.



## **5.28 Handling and Disposal of Coal, Overburden, Excess Spoil and Coal Mine Waste**

### **5.28.10 Coal Removal, Handling, and Storage**

See Section 5.26 of this chapter. See Section 5.4 for removal and reclamation.

### **5.28.20 Overburden**

See Section 5.28.30 for removal and reclamation.

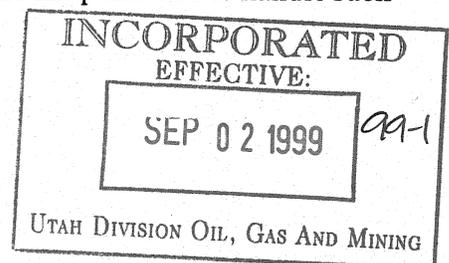
### **5.28.30 Mine Development Waste, and Noncoal Waste Removal, and Overburden**

The Crandall Canyon Mine produces a run of mine product for final sale, this product does not contain any mine related rock or development waste. The method of mining used at the Crandall Canyon mine produces no development waste, however small amounts of rock waste are generated in unexpected roof falls and overcasts. This rock waste is not brought to the surface, but is disposed of on pillar lines or stored in areas that have been mined or where no second mining is to be done. The material disposed of on the pillar lines will be of the same nature that naturally caves in the pillaring process, therefore no leachate will be formed other than that associated with normal pillaring.

In no event will the disposal of this material interfere with future recovery of the coal resource without consent of the BLM or the managing agency of the coal resource. In the unlikely event either rock, development, and/or processing waste is encountered, and the volume exceeds the capacity that can be disposed of along pillar lines; GENWAL commits to disposing of the waste in a DOGM approved disposal facility. GENWAL will notify and consult with DOGM regarding disposal sites; all waste disposal will be done in accordance with MSHA regulations.

The waste generated by the normal underground mining activities will be brought outside the mine for disposal. No oil or grease will be intentionally disposed of underground. All solid waste brought to the surface will be disposed of in a trash container until the container becomes full, at which time the container will be transported to a State approved landfill for final disposal.

At the present time the landfills to be used will be the state approved Nielson landfill or American Kinfold landfill (M&P Enterprises, which are located next to the county landfill, approximately 1.5 miles north of Orangeville, Utah, and if another State approved landfill becomes available and is more cost effective, then this landfill will be utilized. The operator will notify the Division prior to any waste disposal in any landfill other than those mentioned. The location of the new landfill and a statement from the DOH indicating the landfill permit number, the permit term and any conditions that the DOH has concerning the disposal of noncoal waste will be submitted to the Division. In no event will liquids be disposed of in landfills that are not permitted to handle such



material. Scrap metal and used equipment will be removed from the mine unless safety considerations prevent removal.

Oil contaminated soil from the gas and oil storage area will be disposed of prior to reclamation or moving of the facility. If oil or gas spills occur outside the containment area, the spill will be contained, cleaned up and disposed of in a permitted facility. The contaminated material will be disposed of at a facility licensed to accept oil/gas contaminated soil or remediated onsite with appropriate approvals from the pertinent regulatory agencies.

### **Processing Waste**

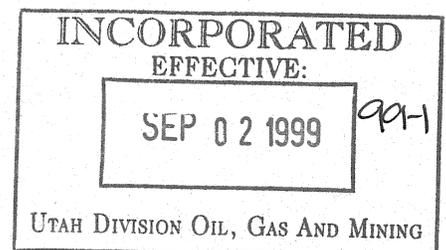
No processing waste is generated at the Crandall Canyon Mine. Only coal is removed from the mine, all of which is trucked off site and sold. Exploratory drill hole data and mining conditions indicate that no development or processing waste will be produced. However, in the unlikely event either rock, development and/or processing waste is encountered, and the volume of waste generated exceeds the capacity that can be disposed of along pillar lines, GENWAL commits to disposing of the waste in a DOGM approved disposal facility. GENWAL will notify and consult with DOGM regarding disposal sites. All disposal operations will be in compliance with Utah Coal Mining regulations R645-301-536 and R645-301-746.

### **Hazardous Wastes**

In the unlikely event that hazardous or toxic material is encountered, GENWAL will notify the Division as well as the State Health Department; the hazardous or toxic material(s) will be disposed of at a facility permitted to accept the specific contaminants found.

### **Sediment Pond Waste**

Sediment removed from the pond during the cleaning process will be hauled to an approved waste disposal facility. Prior to cleaning the sediment pond, representative sediment samples will be collected and analyzed for any acid- and/or toxic forming materials (as listed on page 5-39A). If the analytical results exceed the toxic limit, the waste material will be handled and disposed of in compliance with regulations applicable to acid- and/or toxic forming materials. GENWAL will notify DOGM if the analytical results of the samples show that acid or toxic forming materials are present.



## Sanitary Waste

There are less than 10 regularly assigned employees on the surface per shift. These surface employees use the bathhouse for their sanitary waste needs. Waste from the underground bathhouse toilets and showers is pumped to a holding tank located underground. When required the holding tank is pumped and the materials are disposed of by a licensed contractor at a State Health approved disposal site (See Appendix 5-12). GENWAL will keep records of the sewage pumped from the tank by the contractor. The sanitary waste needs for the miners underground will be handled in accordance with MSHA regulations.

### **5.29 Management of Mine Openings**

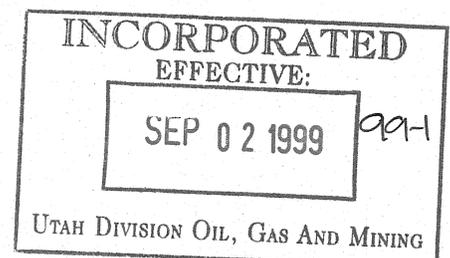
Five portals have been placed on the Star Point Sandstone in the Hiawatha coal seam. Four of the five portals are used while one of the portals is sealed. Three portals are used for intake ventilation, beltline, and return ventilation. The fourth portal opening is used for access to the underground bathhouse. Two identical fans located at the return portal will operate in parallel. One fan will discharge horizontally and the second vertically.

These portals existed during previous mining attempts and will be utilized during current mining operations. The highwall above the portals has been secured and canopies have been installed to maintain the portals at MSHA standards. During operation of the Crandall Canyon Mine, access to all mine openings are controlled by the operator during working and nonworking hours. Due to public access through the mine site, a security person is located at the mine during times of no work or when surface personnel are not present. Permanent sealing of underground openings is discussed in Section 5.42.71 of this chapter.

### **5.30 Operational Design and Plans**

### **5.32 Sediment Control**

The design of the sediment control structures is presented in Chapter 7, Section 7.42 of this document. The designs are intended to minimize the disturbance to the hydrologic balance by disturbing the smallest practical area at any one time during the mining operation through progressive backfilling, grading, and prompt revegetation as required in R645-310-353.200, and to stabilizing the backfilled material to promote a reduction of the rate and volume of runoff in accordance with the regulations.



### 5.33 Impoundments

The only impoundment on the Crandall Canyon Mine site is the sedimentation pond. The design of the sediment control structures is presented in Chapter 7, Section 7.42 of this document. The sedimentation pond meets criteria of R645-301-533 as shown in Appendix 7-10, page 7.

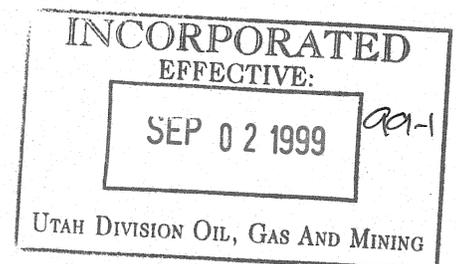
EarthFax Engineering, Inc. previously conducted the sediment pond design and stability analysis (Chapter 7, Section 7.42 and Appendix 7-6) which determined that the old sediment pond was stable under static and seismic conditions. The redesigned pond, constructed in conjunction with the surface facility expansion, does meet the minimum regulatory requirement of 1v:5h combined upstream and downstream side slopes. Refer to Appendix 7-4 for additional detail on the sediment pond.

### 5.34 Roads

The primary roads associated with the Crandall Canyon Mine have been located on the most stable available surfaces. They have been surfaced with materials (gravel, road base, asphalt, etc.) approved by the Division as being sufficiently durable for the anticipated volume of traffic and weight and speed of vehicles using the road. All roads falling under DOGM regulations are built on cut material and, as a result, no embankments were used during road construction. The roads are routinely maintained to include repairs to the road surface, blading, filling potholes and adding replacement surface material when needed. Culverts and ditches have been installed and are maintained to sustain the life of the roads during the operational life of the mine. See Plate 7-5A for the location of culverts and Appendix 7-11 for the culvert designs. See Section 5.27 for further information on these roads.

The area not designated as a primary road is the upper pad. This area has been asphalted to the approval of the Division. The pad is utilized for parking, loading and unloading of supplies and equipment, storage for those supplies, a staging area for new and rebuilt underground equipment, and access to the primary road to the portal area. It is maintained to include repair to the pad surface, blading, filling potholes and adding replacement surface material when needed. Roads within the permit area used for mining operations will comply to R645-301-534.100 through R645-534.340.

After the new expansion facilities were completed, the existing loadout facility, including the truckscalers, were dismantled and removed from the site. The oil storage shed will also be rehabilitated. The area was then regraded and repaved, allowing the Forest Service road to be re-established as a two lane road. In addition, the existing roadway heading up to the truck turnaround area was widened by approximately 15 feet. This resulted in an additional third lane which can be used by the trucks as a stacking lane as they wait to be loaded. This will free up the existing road for unobstructed two way, two lane traffic to better accommodate public, Forest related use of the



road. The turn around area will also be widened to allow the trucks to turn in a standard counter-clockwise direction and thereby eliminate the present practice of clockwise cross traffic turn arounds.

The expanded coal storage capabilities and the new high-speed truck loading facilities now allow the trucks to be loaded in a continuous, uninterrupted basis, thereby eliminating the major cause of tie-ups and congestion.

### 5.35 Spoil

There are no permanent refuse sites located on the property. All spoil is controlled and maintained as described in Section 5.28.30 and Section 7.54 of Chapter 7.

### 5.36 Coal Mine Waste

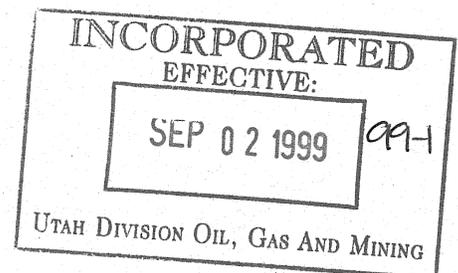
See Section 5.28 of this chapter.

### 5.37 Regraded Slopes

The following information supplied is incorporated within the currently approved mine plan and variances have been granted. If a slide should occur within the permit area, GENWAL will notify the regulatory authority and comply with the remedial measures required by the regulatory agency.

The applicant concurs, that 1:1 excavation slopes are not suitable in the superficial topsoil deposits and have included slope rounding of these slopes at 1.5:1. If the factor of safety of 0.72 was correct, most areas of the existing canyon would already have failed as the natural slope approaches 1:1 in the entire canyon. Any excavation slope greater than 1:1 (with exception of slope rounding) would be unrealistic and impose unnecessary impact far beyond the current limits. In many instances, a 1.5:1 excavation slope is not realistic as the topography of the canyon exceeds this value.

Careful monitoring of construction in critical areas will be necessary to identify and use the correct design profile (i.e. 1:1, 1/2:1, or 1/4:1 slopes). The stability of the recontoured slopes has been demonstrated by the interim reclamation in evidence at the property. A number of these slopes are in excess of the proposed 1.5 to 1 final reclamation contours and have been in place for over ten (10) years. GENWAL will continue to observe these slopes and in the event that a failure occurs or evidence of instability is noted, such as sloughing, tension fractures, etc., all appropriate regulatory authorities will be notified and an acceptable plan to modify the proposed final reclamation contours will be agreed upon at a minimum of five (5) years prior to cessation of mining.



The roads are used to access the portal and substation areas and operations area as shown on Plate 5-3. Cut slopes of 0.25h:1v for competent bedrock, 0.5h:1v for fractured bedrock and 1h:1v for shallow surficial deposits less than four feet deep overlying bedrock are proposed for the portal access roads.

A slope stability investigation was submitted by Delta Geotechnical Consultants and is included as Appendix 5-19 with a safety factor of 0.72 for the shallow surficial deposits of the proposed 1:1 cut slopes. Since the safety factor does not comply with UMC 817.162 (c) requirements, cut slopes with 1:1 slopes will be rounded to 1.5:1 in the shallow superficial material. Appendix 5-16 is a stability analysis of the storage pad (upper pad) at the Crandall Canyon Mine prepared by EarthFax Engineering, Inc. A reclamation slope stability analysis has been prepared by JME Consultants and is included in Appendix 5-21. This analysis shows that the minimum static safety factor of 1.3 for the reclamation fill slopes will be met.

## **5.40 Reclamation Plan**

### **5.41 General**

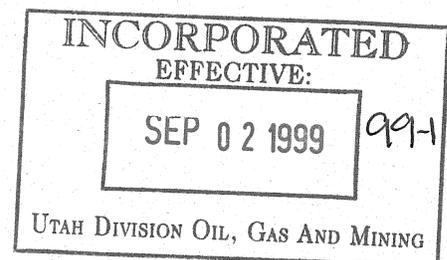
When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

Prior to final sealing of any openings, the BLM will require an on site inspection and a submission of formal sealing methods for approval of the BLM. The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with R645-301-529.100. At the time that the mine closure plan is submitted to the BLM, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery County Recorder's office.

A formal plan will be submitted to the BLM for approval prior to final sealing of any openings. As per their on site inspection and plan approval, the openings will be sealed. All surface equipment, as well as structures, including all concrete foundations, will be removed by the applicant after the permanent cessation of operations.

#### **MW-1 Supply Well Abandonment**

Upon permanent cessation of mining operations, the water supply well, MW-1, will be permanently abandoned in accordance with regulations promulgated by the Utah Division of Water



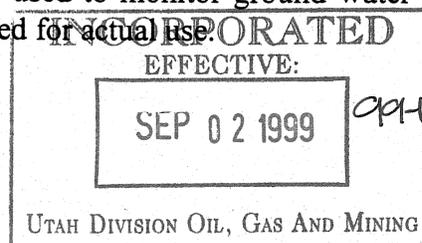
Rights. This will include filling of the well with a neat cement grout in accordance with the regulations.

### Temporary Cessation

If operations are to be temporarily suspended for 30 days or longer, the applicant will submit a notice of intention to the Division. This notice will include a description of the extent and nature of existing surface and underground disturbance prior to temporary cessation. The statement will also cover the type of reclamation which will have been accomplished to date and also include the type of ongoing monitoring, number of opening closures, water treatment activities and other topographic rehabilitative efforts which have been or will be undertaken during this period. The applicant will maintain and secure the surface facilities and mine openings.

GENWAL will implement the temporary cessation regulations as follows:

- (a) GENWAL shall effectively support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit. Temporary abandonment shall not relieve GENWAL of its obligation to comply with any provisions of the approved permit.
- (b) Before temporary cessation of mining and reclamation operations for a period of thirty days or more, or as soon as it is down that a temporary cessation will extend beyond thirty days, GENWAL shall submit to the Division a notice of intention to cease or abandon operations. This notice shall include a statement of the exact number of surface acres and the horizontal and vertical extent of subsurface strata which have been in the permit area prior to cessation or abandonment, the extent and kind of reclamation of surface area which will have been accomplished, and identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures, and water treatment activities that will continue during the temporary cessation.
- (c) Each mine entry which is temporarily inactive but has a further projected useful service under the approved permit application, shall be protected by barricades or other covering devices, fenced and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices shall be periodically inspected and maintained in good operating condition by GENWAL.
- (d) Each exploration hole, other drill hole, bore hole, shaft, well or other exposed underground opening which has been identified in the approved permit application for use to return underground workings, or to be used to monitor ground water conditions, shall be temporarily sealed until required for actual use.



**5.42 Narratives, Maps, and Plans**

**5.42.10 Timetable**

All reclamation, other than areas handled in interim reclamation, will commence with removal of the surface structures, redistribution of the cut and fill materials and final grading of disturbed surface areas. Within 30 days following completion of final grading (which should be in August), topsoil from the stockpile will be redistributed. Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil before the end of October. Seeding, transplanting and mulching will then proceed when moisture conditions are optimal for planting and seeding. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in conjunction with seeding or in the following spring, as soon as one can work the soil.

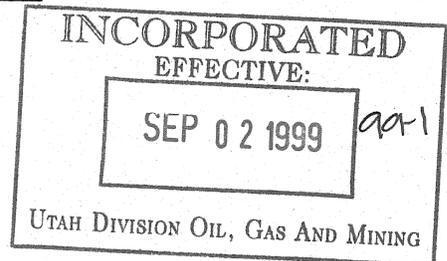
A reclamation sequence for the mine yard, including the proposed culvert expansion project, is described in Appendix 5-22.

Timetable-Reclamation Activities: First available season following cessation of mining

- Normal Access- May 15,      Begin demolition- May 15
- Structure removal- May 15 to June 30
- Seal portals- Sept 1 to Sept 30
- Asphalt Removal- June 15 to June 30
- Earthwork/recontouring- May 15 to September 30
- Topsoil redistribution- August 30 to Oct 15
- Drainage Construction- Sept 1 to Sept 30
- Hydroseeding- Sept 15 to Oct 30
- Seeding/Planting- Oct 1 to Oct 30

Final Reclamation- (cessation of mining)

Year 1	May	June	July	Aug.	Sept.	Oct.
Struct. remove		_____				
Portal Seals					_____	
Asphalt remove		_____				
Earthwork/recontour		_____	_____	_____	_____	
Topsoil redistribution/final grade					_____	_____
Drainage Construction					_____	
Seeding/Mulching						_____
Planting						_____



## Year 2 through 10

Vegetation Monitoring	<u>July 1 to August 30</u>
Hydrologic Monitoring	<u>June 1 to Oct 30 (4 times)</u>
Subsidence Monitoring	<u>July 1 to Oct 30</u>

### 5.42.20 through 5.42.32 Final Surface Configuration

All areas affected by surface operations will be graded and restored to approximate original contour. All final grading will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to the equipment operators. Backfilling and grading will proceed so as to eliminate the cut slopes and highwalls. Refer to Plates 5-16, 5-17, and 5-17A. The proposed culvert expansion project will supply all backfill material needed to achieve approximate original contour and to reclaim existing highwalls.

A reclamation map showing post construction interim reclamation area, Plate 7-5, and final reclamation, Plates 5-16, 5-17, and 5-17A, accompanies this document. Slope rounding on Plate 5-3 has been revised to meet the required slope of 1.5:1 at the specified reclaimed cross sections.

#### Interim Reclamation

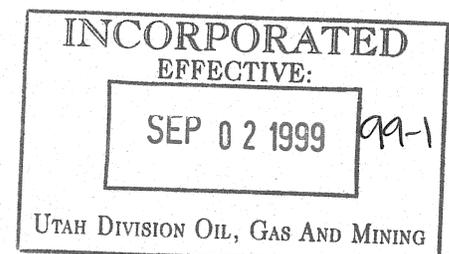
All surface areas disturbed during construction and which are not needed for mining operations were revegetated in the fall of the year following completion of the construction. This revegetation was performed as described in Chapter 3 of this document.

Disturbed areas within the mine plan area that contribute water directly to the sediment pond have undergone interim reclamation. The goal of this reclamation was to achieve vegetative cover that will minimize erosion thus reducing the amount of soil material entering the sediment pond. To achieve this goal, a standard of 80% vegetative cover was met. Ocular estimates of cover are made each fall (early September) to determine if supplemental seeding is warranted.

A reclamation map showing post construction interim reclamation areas and final reclamation accompanies this chapter as Plate 5-17. The correct number of acres to be revegetated in final reclamation is 8.73 acres.

### 5.42.40 Bond Release

Before seeking bond release, GENWAL will provide a description of all temporary structures to be removed and reclaimed. No permanent sedimentation ponds, impoundments, and treatment



facilities that meet the requirements of the R645 rules for permanent structures will remain after final reclamation, Phase 2.

#### 5.42.50 Timetable and Plans, Removal of Sedimentation Pond

The sediment pond will remain after the mining operations and through phase 1 reclamation until adequate revegetation has been established to control erosion. Reclaimed disturbed area drainages will be routed to the pond and diversions will be maintained to preserve the integrity of the pond until requirements of R645-301-763.100 have been met. These diversions can be found on Plate 5-16 and 7-5.

Upon approval of phase 1 revegetation, the sediment pond will be cleaned out and the material disposed of in the approved method. The sediment which accumulates in the sediment pond as a result of runoff from the reclaimed area should only be topsoil that has eroded from the reclaimed site (care will be taken not to mix the pond liner with this topsoil). This topsoil will be excavated, stockpiled and allowed to dry. Once the topsoil has been dried the sediment pond will be removed and the area regraded to remove any capability to impound water. Topsoil will be redistributed over the reclaimed sediment pond site and the area reseeded.

Removal of the sediment pond was included during final reclamation to comply with the direct request of the Price Office of the U.S. Forest Service.

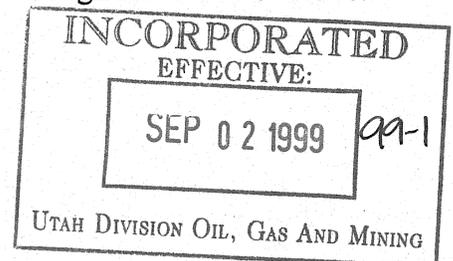
#### 5.42.60 Roads

The Forest Service Development Road from Huntington Creek to the Forest Service turn around will remain as part of the post mining land use in accordance with the Forest Service permit shown in Appendix 1-2. During reclamation, the Forest Service access road will be altered to comply with the special use permit. GENWAL has and maintains a "reclamation" bond with the Forest Service which covers the costs for the proposed post-mining road configuration.

As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt and subgrade removed from the permit area as part of this road narrowing will be taken to a RCRA-approved disposal site.

Based on recent correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. GENWAL commits to reclaiming the road through the minesite to the specifications stated in the Road Use Permit.

All other roads used for the operation of the Crandall Canyon Mine, within the permit boundaries, will be reclaimed in accordance with R645-301-542.610 through R645-301-542.640.



#### 5.42.70 Final Abandonment of Mine Openings and Disposal Areas

The old truck loadout was dismantled once the new loadout facility became operational. The loadout structures were removed and the excess coal around the area was cleaned up and hauled to the new coal stockpile area. This area will provide a place to store material as well as snow and salt in the winter time.

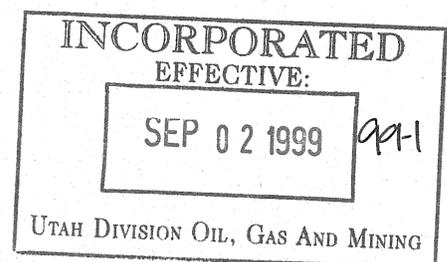
After the new loadout facilities was constructed, the existing loadout area was removed and the area rehabilitated and cleaned up. These rehabilitation measures include the following:

- a) The existing loadout facilities will be dismantled and removed from the site, including the coal bin, crushers, scalehouse and loading chute.
- b) The existing truck scale will be removed from the middle of the road and the roadway will be regraded and repaved.
- c) The existing oil shed will be rehabilitated and the roadway will be regraded and repaved in this area.
- d) The existing coal pile/storage area will be totally cleaned up. All coal and coal products will be removed. The area will then be swept and vacuumed.
- e) The hillside below the coal storage area will be dressed up. The mine discharge waterlines will be relocated in a more orderly fashion. Coal products will be vacuumed from the hillside.

#### 5.42.71 Closure and Management of Mine Openings

When no longer needed for mining operations, all entry ways or other openings to the surface from the underground mine will be sealed and backfilled. Prior to the sealing of the mine openings, all combustible material will be removed from the underground bathhouse. All structures that will interfere with sealing of the mine openings will also be removed. The permanent closures will be constructed to prevent access to the mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

All combustible material will be removed from underground and hauled to a state approved land fill. The portals will be backfilled with soil and two rows of solid concrete blocks placed across each entry and then backfilled to the surface and recontoured as shown on Plate 5-17. The block stoppings will be placed as far from the surface as is necessary to obtain a competent top and bottom.



#### 5.42.72 through 5.42.742 Excess Waste

All waste material generated from the removal of the structures will be removed from the property and sold as scrap or disposed of in a state approved land fill. See Section 5.28 of this chapter for more detail on excess waste and spoil.

#### 5.42.80 Estimate of Reclamation Costs

Estimate of reclamation costs as provided by the Division (included under Appendix 5-20) is as follows:

##### Direct Costs

Subtotal Demolition and Removal	\$630,986.00	
Subtotal Backfilling and Grading	\$451,209.00	
Subtotal Revegetation	\$42,385.00	
Direct Costs	\$1,124,580.00	
Indirect Costs	\$112,458.00	10.0%
Mob/Demob	\$56,229.00	5.0%
Contingency	\$56,229.00	2.5%
Engineering Redesign	\$28,115.00	2.5%
Main Office Expense	\$76,471.00	6.8%
Project Management Fee	\$28,115.00	2.5%
Subtotal Indirect Costs	\$301,388.00	26.8%
Total Cost in 2003 Dollars	\$1,425,968.00	
Escalation factor		0.0289
Number of years		4
Escalation	\$172,126.00	
Reclamation Cost 2007	\$1,598,094.00	
Bond Amount (rounded to nearest \$1,000)	\$1,598,000.00	

Revised 06/06/2003

04/99 Revised 07/99

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### **5.53 Backfilling and Grading**

Backfilling and regrading of disturbed lands has been designed to restore all disturbed areas affected by surface operations to the approximate original contour of the land. This is made possible by the fill material required by the 1997 facility expansion project. Reclamation of affected areas, including revegetation is outlined in Chapter 3, Section 3.41.

During reclamation, the subsoils or backfill material will be laid down in 12" to 18" lifts and compacted through repeated travel by heavy equipment. This method has been utilized by a number of mines in the area and appears to give excellent compaction prior to topsoiling. In areas with slopes of less than 30%, the subsoil will be ripped to a depth of 18" prior to topsoil placement. In areas having average slopes of more than 30% the subsoil will be ripped to a depth of 12", where practical. Topsoil will then be redistributed in a manner that achieves an approximate, uniform stable thickness and other specifications stated in Chapter 2, Section 2.42 of this document.

#### **Removal or Reduction of Cut Slopes and Highwalls**

Prior to backfilling and grading of the highwall area above the portals and the cutslopes above the old coal loadout area and the pocket cuts at the south portals, existing shotcrete, wire mesh, clips, and other related material will be removed and disposed of in an appropriate manner. All noncombustible material generated from the removal of shotcrete will be disposed of underground (within the mine) prior to the sealing of the portals. All other waste generated will be removed and disposed of in an appropriate State permitted land fill.

Backfilling and grading will proceed so as to eliminate the cut slope, pocket cuts and highwall. Refer to Plate 5-3 for the highwall location. The cut slope above the coal stockpile area will be backfilled to match the approximate original contour with fill material from the Expansion Area pad. The Forest Service Trailhead Access Road will be left in place, but the surface will be modified to meet design specifications, as directed, by the Forest Service (see Appendix 1-2). See Plate 5-17 for the Forest Service road location.

The stability of the reclaimed highwall and cutslopes has a safety factor greater than 1.3 and is shown in Appendix 5-21.

No highwalls or remnants will remain after reclamation.

#### **Terracing and Erosion Control**

No terracing will be done. All final grading and surface preparation of overburden completed prior to the redistribution of the topsoil will be done along the contour to minimize erosion in areas with slopes less than 30%. In areas with slopes greater than 30% the grading, preparation and placement in a direction other than generally parallel to the contour will be used.  
Revised 4/05/2003

**Refuse Piles**

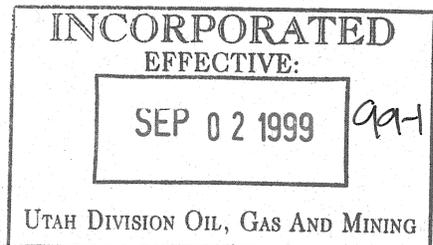
There are no refuse piles at the Crandall Canyon mine site.

**Surface Coal Mining**

There will be no surface coal mining at the Crandall Canyon Mine.

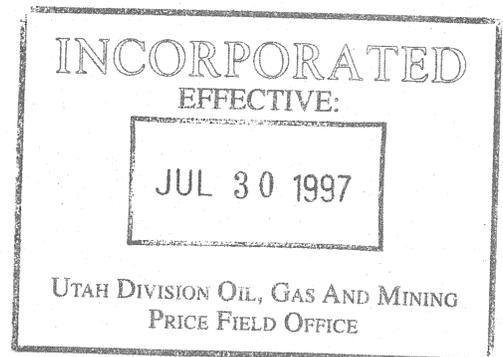
**5.60 Performance Standards**

All mining and reclamation operations at the Crandall Canyon Mine will be conducted in accordance with the R645 rules and this permit.



**CHAPTER 5**

**FIGURES**



# MAXIMUM SUBSIDENCE GRAPH

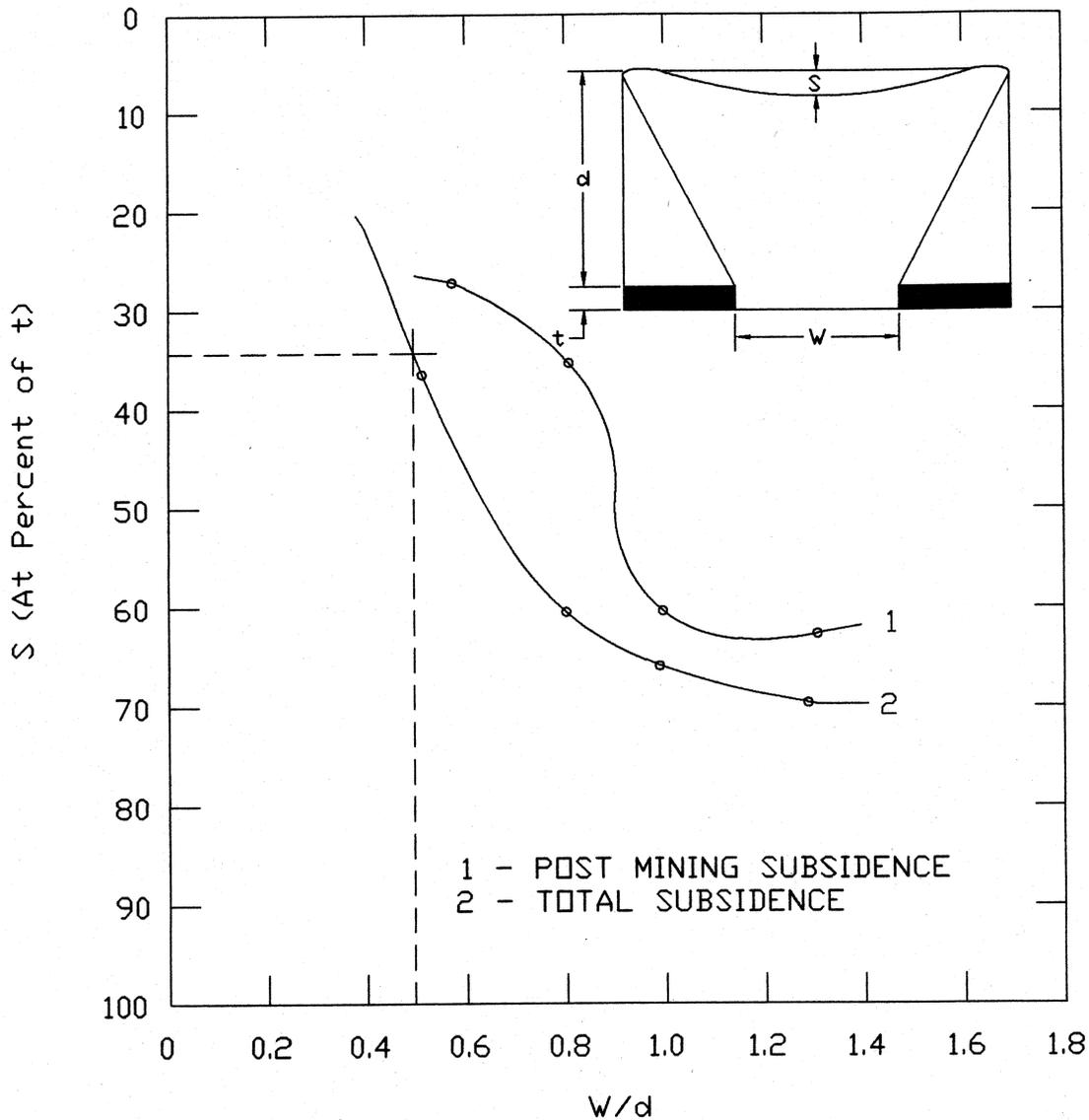


Figure 5-4

Maximum subsidence, as a percentage of seam thickness, versus width/depth ratio for room and pillar mine at Somerset, Colorado (after Dunrud, 1980).

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EFFECTIVE:

JUL 30 1997

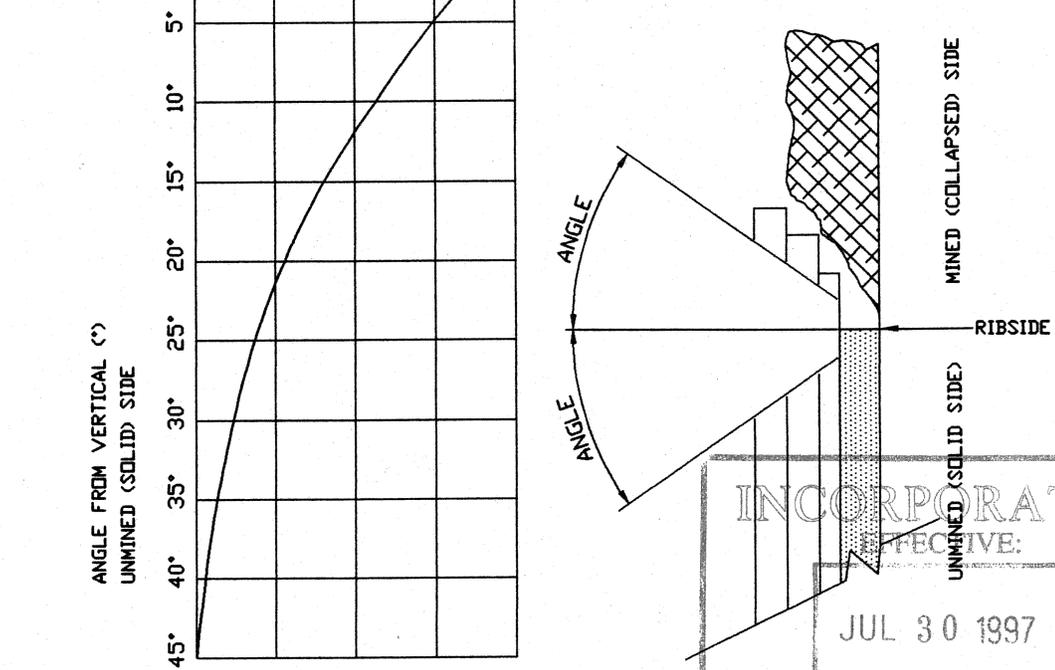
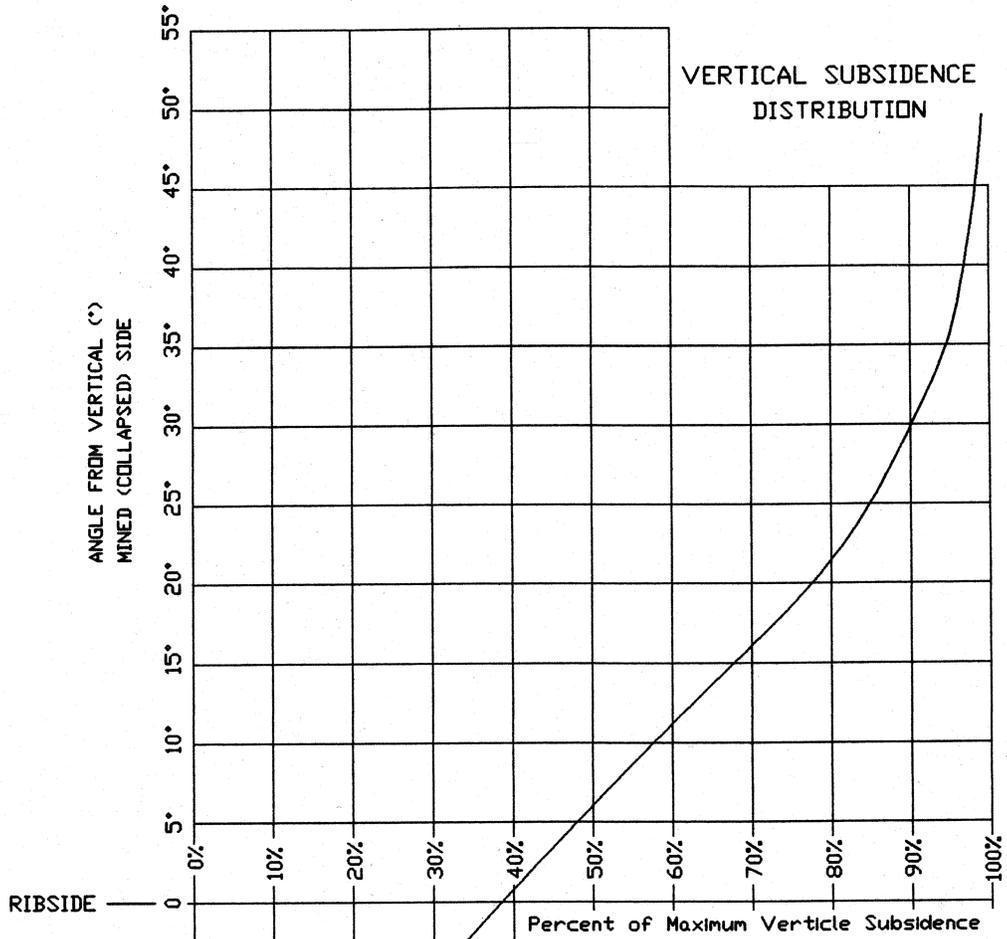
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PRICE FIELD OFFICE

ACAD REF: SUB2.DWG

FIGURE 5-5

GROUND SURFACE

ORIGINAL



INCORPORATED  
 SPECIFIC:  
 JUL 30 1997

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 PRICE FIELD OFFICE  
 ACAD REF: SUB1.DWG

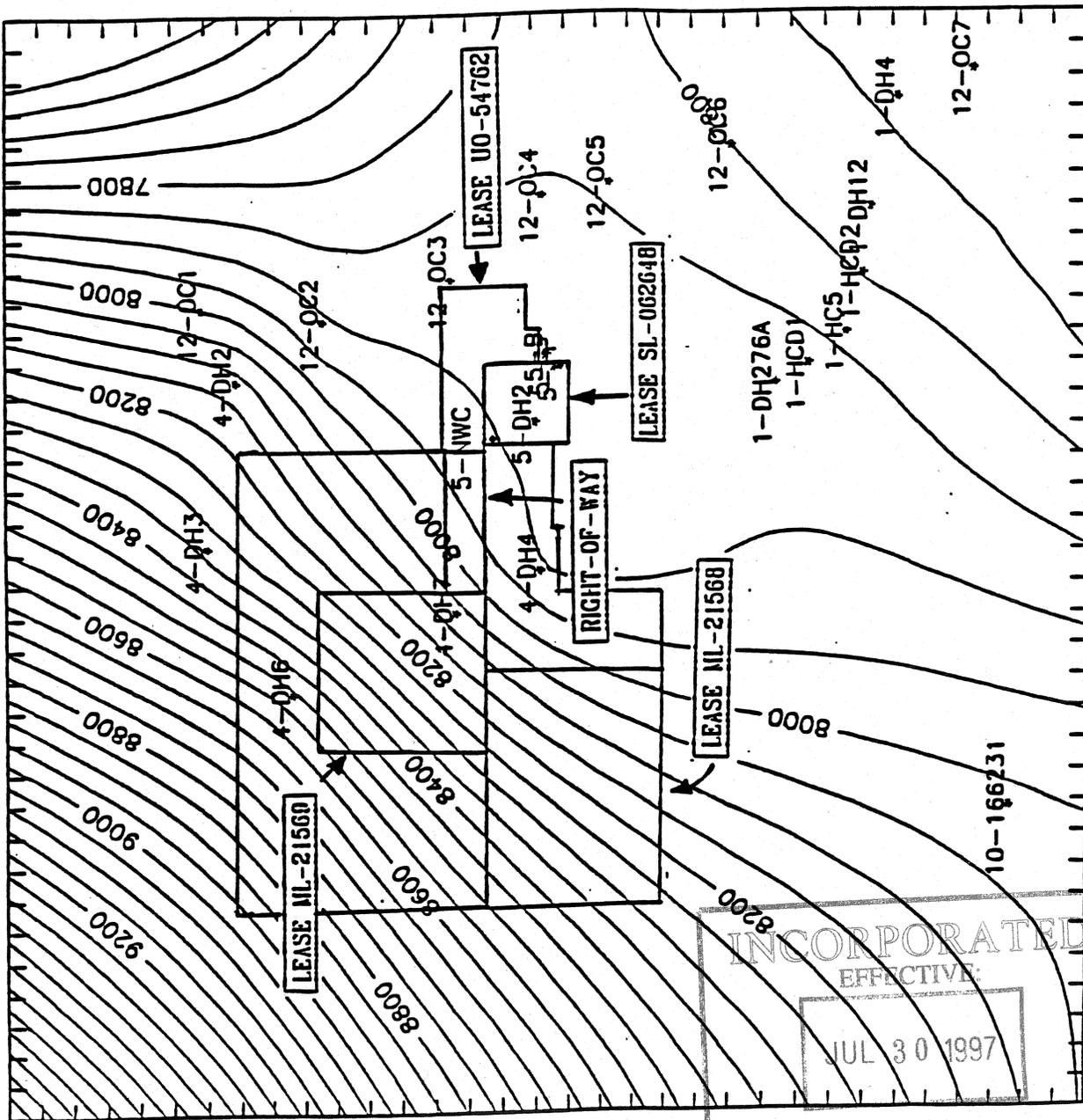


FIGURE 5-8

CONTOUR INTERVAL 50 FT.

SCALE 5000'



EarthFax Engineering Inc.  
Engineers/Scientists

FIGURE 5-8 STRUCTURE MAP

TOP OF HIAWATHA COAL SEAM.

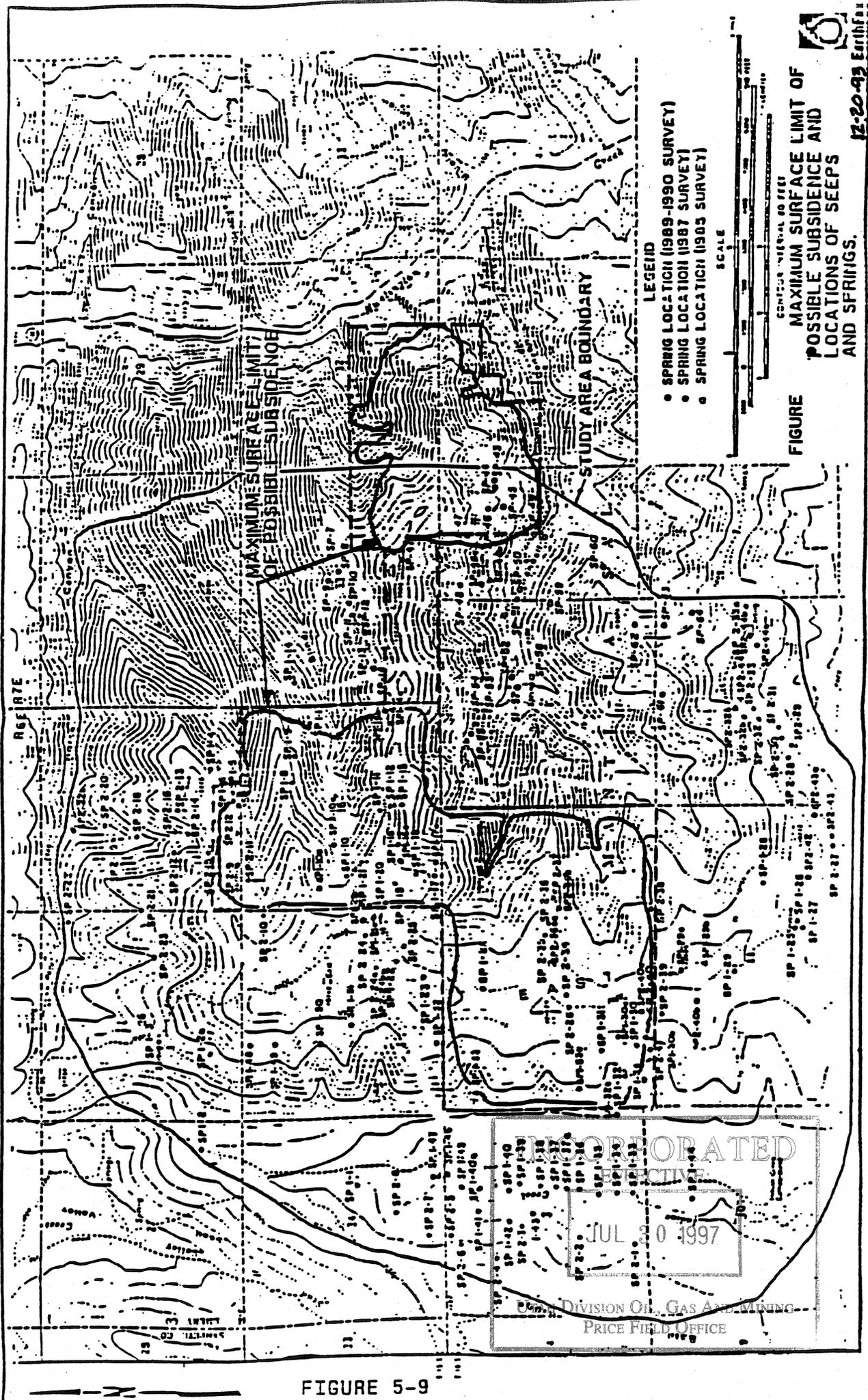
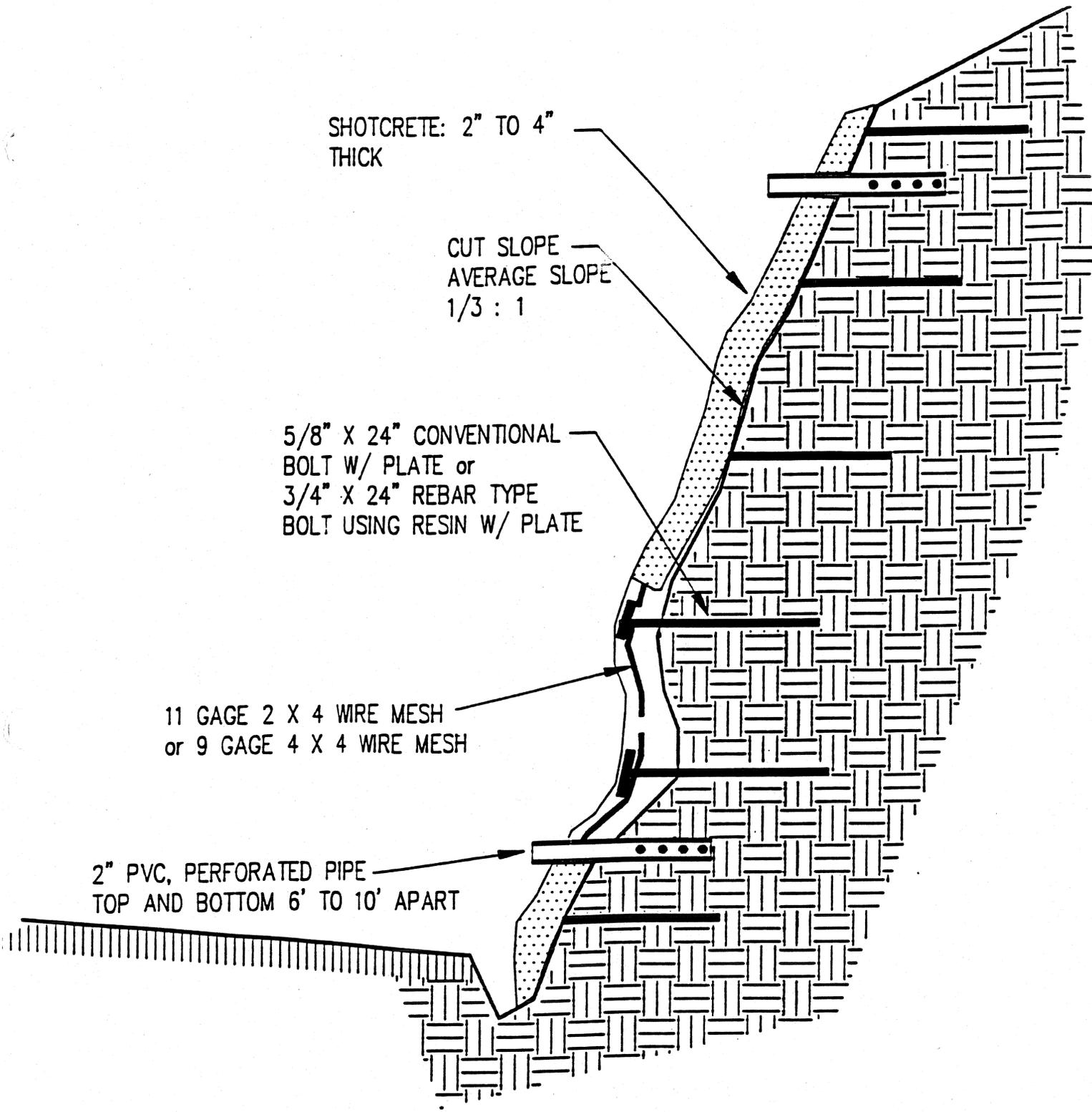


FIGURE 5-9



SHOTCRETE: 2" TO 4"  
THICK

CUT SLOPE  
AVERAGE SLOPE  
1/3 : 1

5/8" X 24" CONVENTIONAL  
BOLT W/ PLATE or  
3/4" X 24" REBAR TYPE  
BOLT USING RESIN W/ PLATE

11 GAGE 2 X 4 WIRE MESH  
or 9 GAGE 4 X 4 WIRE MESH

2" PVC, PERFORATED PIPE  
TOP AND BOTTOM 6' TO 10' APART

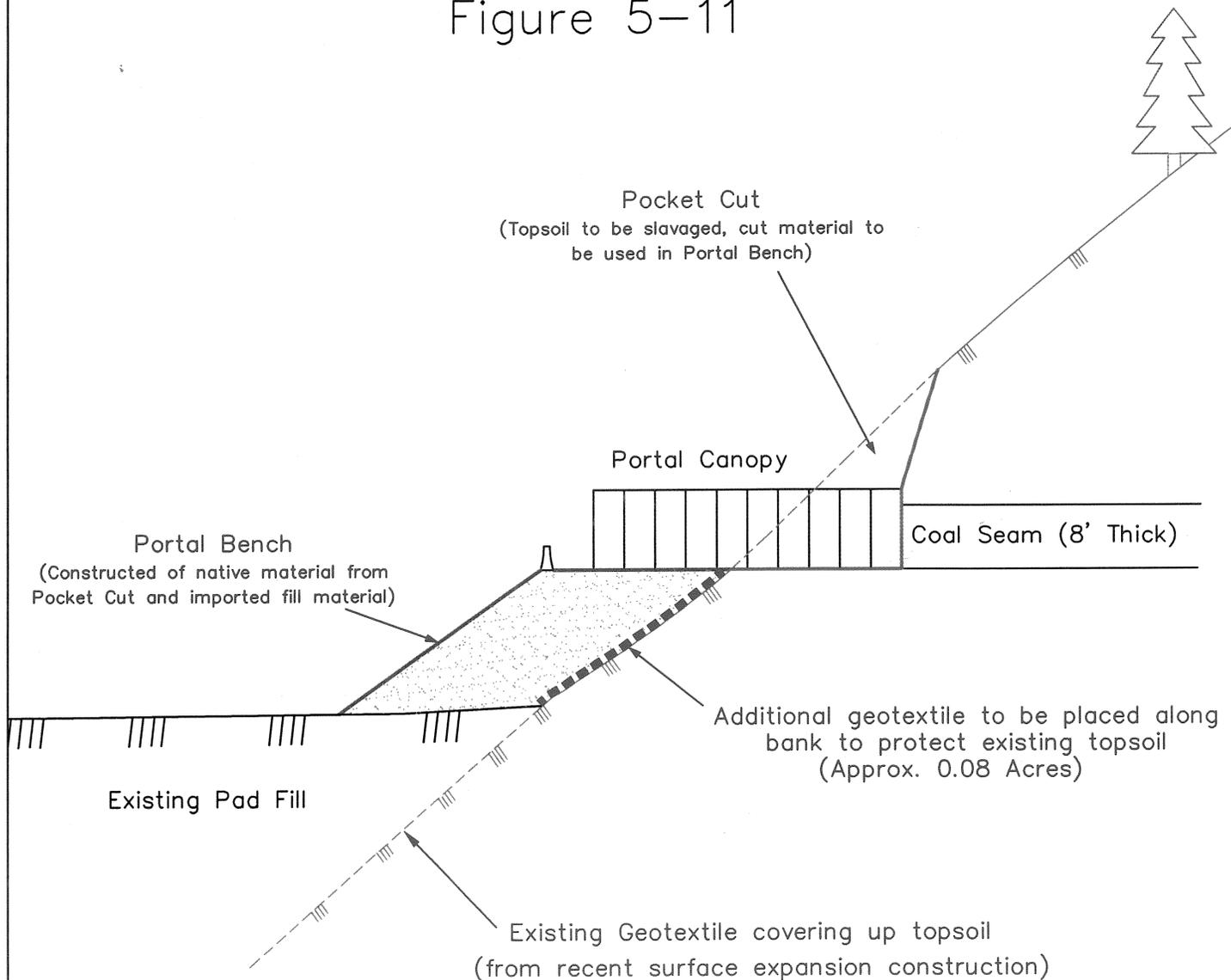
**TYPICAL SHOTCRETE APPLICATION  
TO CUT SLOPES  
SCALE: NONE**

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EFFECTIVE:  
JUL 30 1997  
UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE

FIGURE 5-10

# Profile of South Portal Pocket Cuts Typical Section Through Intake Portal

## Figure 5-11



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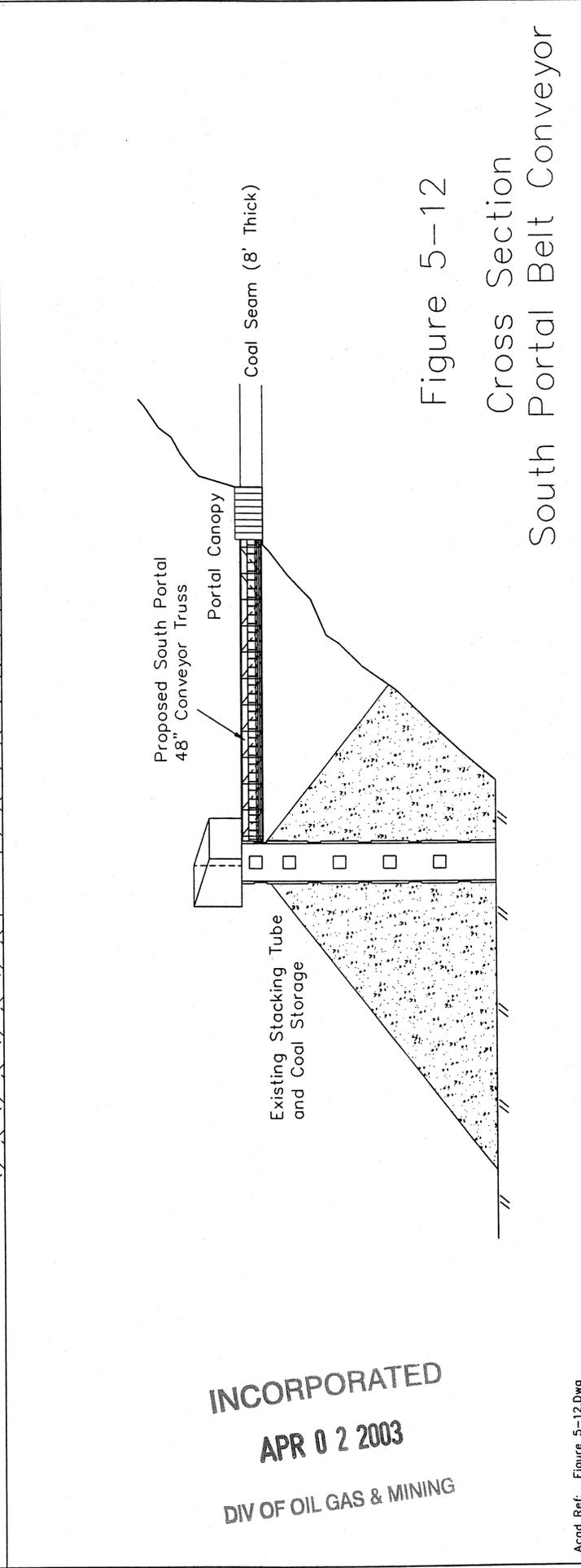
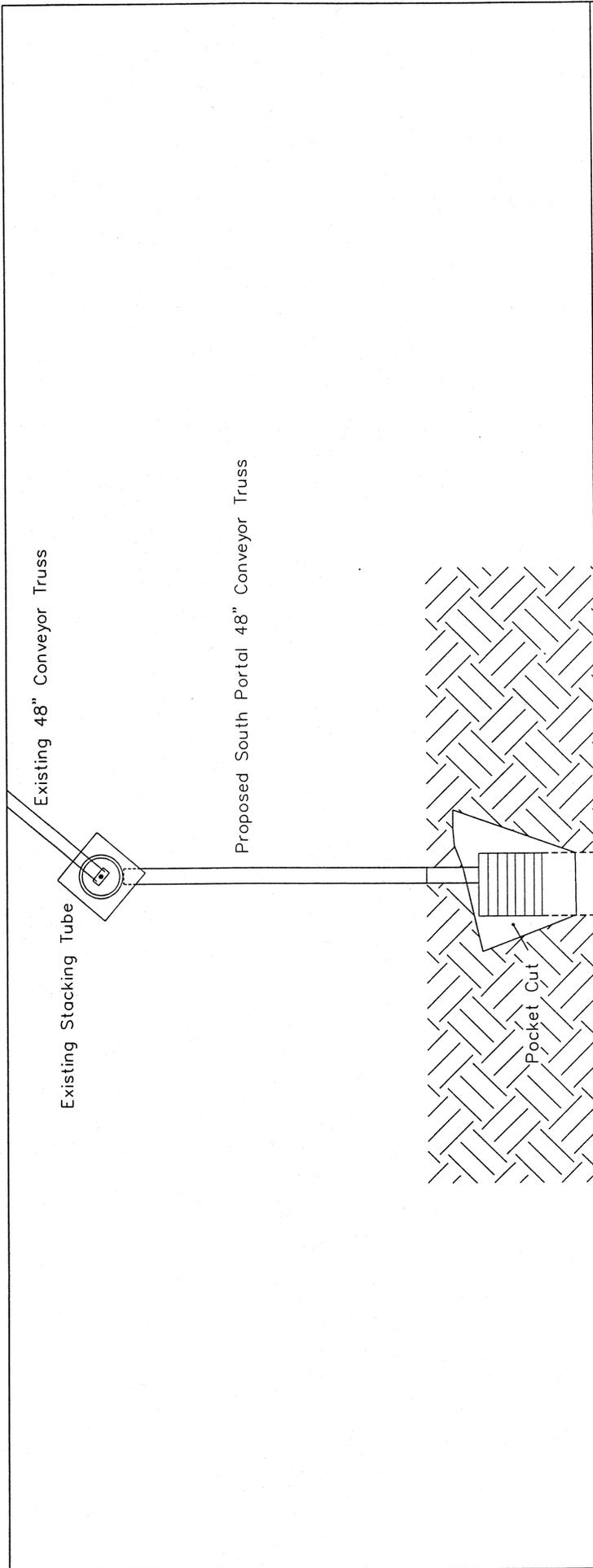


Figure 5-12  
 Cross Section  
 South Portal Belt Conveyor

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**APR 02 2003**  
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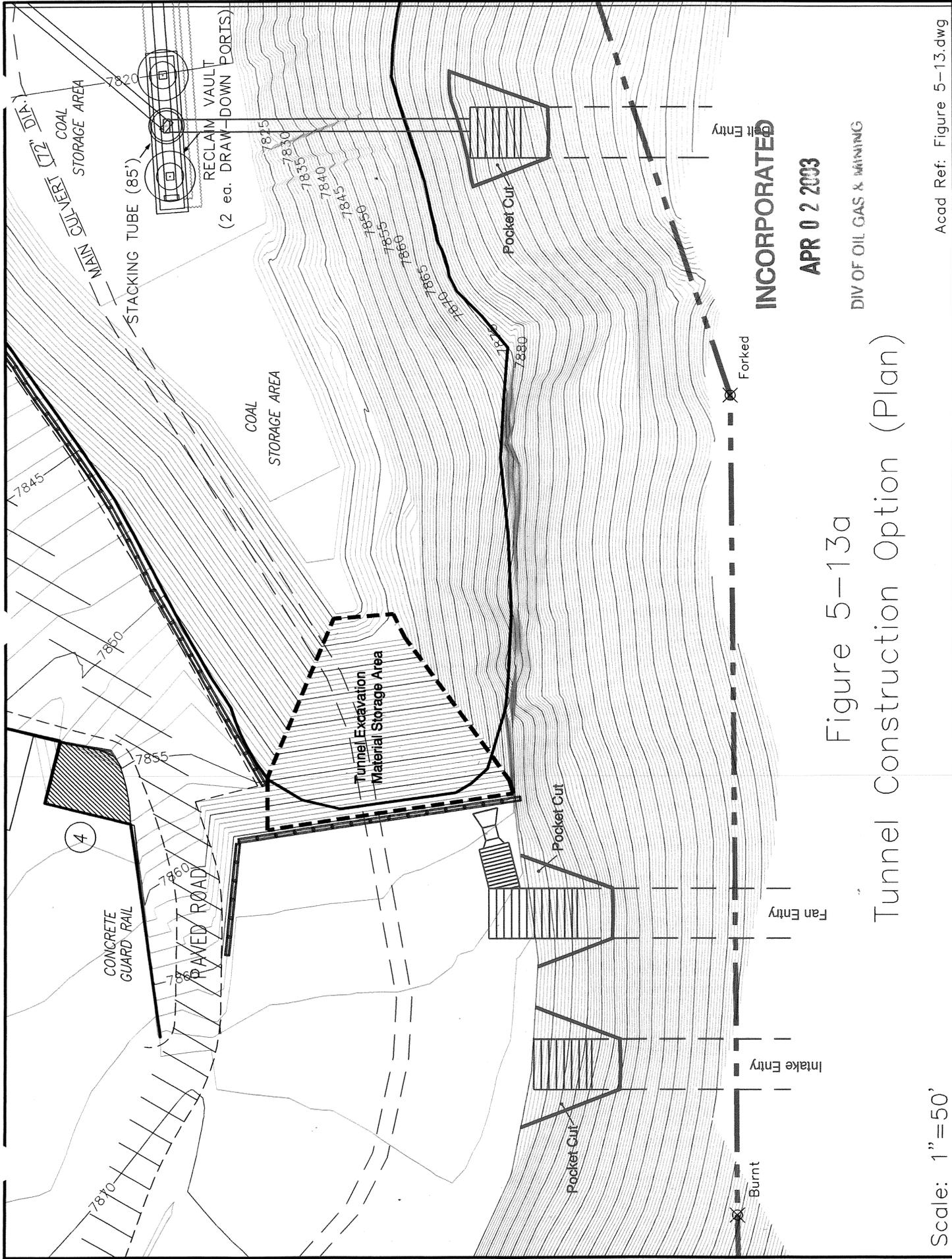


Figure 5-13a  
 Tunnel Construction Option (Plan)

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**APR 02 2003**

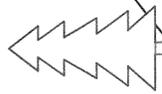
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Scale: 1" = 50'

Acad Ref: Figure 5-13.dwg

# Tunnel Construction Option (Profile)

Figure 5-13b



Pocket Cut  
(Topsoil to be salvaged  
prior to excavation)

Coal Seam (8' Thick)  
(weathered/burnt at outcrop)

Portal Canopy

Tunnel access

Existing Pad Fill

Existing Geotextile covering up topsoil  
(from recent surface expansion construction)

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Appendix 5-20

Bond Calculations  
(DOGM)

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Bonding Calculations  
 Crandall Canyon Mine C/007/032  
 Revised

June 3, 2003

Bond Summary

Direct Costs

Subtotal Demolition and Removal	\$630,986.00	
Subtotal Backfilling and Grading	\$451,209.00	
Subtotal Revegetation	\$42,385.00	
Direct Costs	\$1,124,580.00	

Indirect Costs

Mob/Demob	\$112,458.00	10.0%
Contingency	\$56,229.00	5.0%
Engineering Redesign	\$28,115.00	2.5%
Main Office Expense	\$76,471.00	6.8%
Project Mainagement Fee	\$28,115.00	2.5%
Subtotal Indirect Costs	\$301,388.00	26.8%

Total Cost in 2003 Dollars	\$1,425,968.00	
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Escalation factor		0.0289
Number of years		4
Escalation	\$172,126.00	

Reclamation Cost 2007	\$1,598,094.00	
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Bond Amount (rounded to nearest \$1,000)	\$1,598,000.00	
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
D1	Shop 01																					
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	160	20	20										64000	CF	\$16,000.00		
	Structure's Vol. Demolished																	0.35	830	CY		
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY														830	CY	\$8,591.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	Nielson Construction	Nielson Con.		7/TON														830	CY	\$5,810.00	
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																				\$30,401.00	
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	160	20	0.5											59	CY	\$594.00	
	Concrete's Vol. Demolished																		1.3	77	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY															77	CY	\$104.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY															77	CY	\$249.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY															77	CY	\$554.00
	Subtotal																					\$1,501.00
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																					\$31,902.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
02	Ventilation Fan 02																				
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	60	20	16.67										20004	CF	\$5,001.00	
	Structure's Vol. Demolished																	0.35	259	CY	
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY														259	CY	\$2,681.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nelson Construction	Nelson Con.		7 /TON														259	CY	\$1,813.00
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				\$8,495.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	CY	60	20	0.5											22	CY	\$221.00
	Demolition Cost																		1.3	29	CY
	Concrete's Vol. Demolished																				\$39.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY																\$94.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY																\$209.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY																\$583.00
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$10,058.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost					
03	Rock Dust Silo 03								30	12						FT		3383	CF	\$848.00					
	Structure's Demolition Cost	Steel Bid. Large	02220 100 0012	0.25	/CF													0.35	44	CY					
	Structure's Vol. Demolished																								
	Rubble's Weight (exclude steel)																								
	Truck's Capacity																								
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY															44	CY	\$455.00			
	Transportation Cost Non Steel Truck																								
	Transportation Cost Non Steel Drive																								
	Disposal Cost Non Steel	Nielson Construction	Nielson Con.		7	TON															44	CY	\$308.00		
	Steel's Weight																								
	Truck's Capacity																								
	Haulage																								
	Transportation Cost Steel Truck																								
	Transportation Cost Steel Truck Drive																								
	Disposal Cost Steel																						\$1,611.00		
	Subtotal																								
	Equipment's Disposal Cost																								
	Dismantling Cost																								
	Equipment's Vol. Demolished																								
	Loading Costs																								
	Transport Costs																								
	Disposal Costs																								
	Subtotal																								
	Concrete Demolition																								
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	2	3	2													4	2	CY	\$20.00	
	Concrete's Vol. Demolished																					1.3	3	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																		3	CY	\$4.00
	Transportation Cost	1/2 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																		3	CY	\$10.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																		3	CY	\$22.00
	Subtotal																							\$58.00	
	Concrete Demolition																								
	Demolition Cost																								
	Concrete's Vol. Demolished																								
	Loading Cost																								
	Transportation Cost																								
	Disposal Costs																								
	Subtotal																								
	Concrete Demolition																								
	Demolition Cost																								
	Concrete's Vol. Demolished																								
	Loading Cost																								
	Transportation Cost																								
	Disposal Costs																								
	Subtotal																								
	Total																							\$1,687.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
D4	Concrete Dump Pad 04																					
	Structure's Demolition Cost																					
	Structure's Vol. Demolished																					
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel																					
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																					
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	30	25	1								FT		28	CY	\$282.00		
	Demolition Cost																	1.3				
	Concrete's Vol. Demolished																		36	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															36	CY	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															36	CY	
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															36	CY	
	Subtotal																				\$708.00	
	Asphalt Demolition	Pavement removal (asphalt) 3 inch	02220 875 1710	3.89	/SY	135	130		0.25							FT			1950	YD2	\$7,566.00	
	Demolition Cost																		1.3			
	Concrete's Vol. Demolished																			211	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																211	CY
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																211	CY
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																211	CY
	Subtotal																				\$10,072.00	
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																				\$10,778.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
05	Power Center 05																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	<b>Subtotal</b>																				
	Mechanical Equipment	Mechanical equipment heavy	15055 300 3600	745/ton									5			Ton		5	Ton	\$3,725.00	
	Transformer	Mechanical equipment heavy	15055 300 3600	745/ton									2			Ton		2	Ton	\$1,490.00	
	Underground Wire	Wire Removal	Soldier Creek	4.81/LF		900										CLF		900	LF	\$4,329.00	
	Aerial Wire	Wire Removal	Soldier Creek	4.81/LF		500										CLF		500	LF	\$2,405.00	
	Chain Link Fence	Chain link remove 8'-10'	02220 875 0700	2.77/LF		120										LF		120	LF	\$332.00	
	<b>Subtotal</b>																			\$12,281.00	
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06/CY		25	21	0.67										1.3	13	CY	\$131.00
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35/CY																	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0300	3.23/CY																	
	Disposal Costs	Disposal on site	02220 550 4200	7.2/CY																	
	<b>Subtotal</b>																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	<b>Total</b>																				\$12,812.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
06	Power Poles 06																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Remove wire	Wire Removal	Soldier Creek	4.81 /LF		180												180 LF		\$866.00	
	Remove conduit (use wire)	Wire Removal	Soldier Creek	4.81 /LF		100												100 LF		\$481.00	
	Remove Fixtures (use poles)	Powerpole	Hiawatha	100 EA														6 EA		\$600.00	
	Remove Poles	Powerpole	Hiawatha	100 EA														6 EA		\$600.00	
	Disposal Costs																				
	Subtotal																				\$2,547.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$2,547.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
07	Underground Bathhouse 07																				
	Structure's Demolition Cost	Masonry Bld. Large	02220 100 0080	0.26	CF						14000					CF	0.35	14000	CF	\$3,640.00	
	Structure's Vol. Demolished																	181	CY		
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY													181	CY	\$1,873.00	
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	City Services	City Service Price	4	CY													181	CY	\$724.00	
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																			\$6,237.00	
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	70	20	0.5										28	CY	\$282.00	
	Concrete's Vol. Demolished																	1.3	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY														34	CY	\$46.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY														34	CY	\$110.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY														34	CY	\$245.00
	Subtotal																			\$663.00	
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																			\$6,600.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swall Factor	Quantity	Unit	Cost
08	Portals 08																			
	Structure's Demolition Cost	Seal Portals	AML1	5200	EA										6	EA		6	EA	\$31,200.00
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			\$31,200.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			\$31,200.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
D9	Belt Portals D9																			
	Structure's Demolition Cost	Seal Portals	AML1	5200	EA										1	EA		1	EA	\$5,200.00
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			\$5,200.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			\$5,200.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost			
10	Crusher Pad 10																						
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	36	20	1										0.35	720	CF	\$180.00		
	Structure's Vol. Demolished																		9	CF			
	Rubble's Weight (exclude steel)																						
	Truck's Capacity																						
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY															9	CY	\$93.00	
	Transportation Cost Non Steel Truck																						
	Transportation Cost Non Steel Drive																						
	Disposal Cost Non Steel	City Services	City Service Price		4	CY														9	CY	\$36.00	
	Steel's Weight																						
	Truck's Capacity																						
	Haulage																						
	Transportation Cost Steel Truck																						
	Transportation Cost Steel Truck Drive																						
	Disposal Cost Steel																						
	Subtotal																				\$509.00		
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	745	ton								3			ton			3	ton	\$2,235.00		
	Dismantling Cost																						
	Equipment's Vol. Demolished																						
	Loading Costs																						
	Transport Costs																						
	Disposal Costs																						
	Subtotal																				\$2,235.00		
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	CY	36	20	1												27	CY	\$272.00	
	Demolition Cost																			1.3	CF		
	Concrete's Vol. Demolished																						
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY																35	CY	\$47.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY																35	CY	\$113.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY																35	CY	\$252.00
	Subtotal																					\$684.00	
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	CY							418									15	CY	\$151.00
	Demolition Cost																			1.3	CF		
	Concrete's Vol. Demolished																						
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY																20	CY	\$27.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY																20	CY	\$65.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY																20	CY	\$144.00
	Subtotal																					\$387.00	
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal																						
	Total																					\$3,615.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
11	Mine Bell 11																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	<b>Subtotal</b>																			
	Equipment's Disposal Cost																			
	Dismantling Cost	Mechanical equipment heavy	15055 300 3600		745/ton								2.5			ton			3/ton	\$2,235.00
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	<b>Subtotal</b>																			\$2,235.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	<b>Total</b>																			\$2,235.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
13	Silo 13																					
	Structure's Demolition Cost	Mixed Materials Bld. Large	02220 100 0100	0.26	/CF				75	30						FT		53014	CF	\$13,784.00		
	Structure's Vol. Demolished																	0.35	687	CY		
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY														687	CY	\$7,110.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price	4	/CY														687	CY	\$2,748.00	
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																				\$23,642.00	
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	745	/ton							20				ton			20	ton	\$14,800.00	
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																				\$14,800.00	
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	160	20	0.5														
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY														1.3	77	CY	\$104.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															77	CY	\$249.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															77	CY	\$554.00
	Subtotal																				\$1,501.00	
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																				\$40,043.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
14	Weight Shed 14																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal:																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal:																				
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY						2					CY		2	CY	\$20.00	
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY													1.3	3	CY	\$39.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																\$4.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																\$10.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																\$22.00
	Subtotal:																				\$56.00
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY						235					CF		9	CY	\$91.00	
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY													1.3	12	CY	\$16.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																\$39.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																\$86.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																\$232.00
	Subtotal:																				\$391.00
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY						80					CF		3	CY	\$30.00	
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY													1.3	4	CY	\$5.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																\$13.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																\$29.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																\$77.00
	Subtotal:																				\$300.00
	Total:																				\$395.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
15	Bulk Oil 15																					
	Structure's Demolition Cost	Masonry Bld. Large	02220 100 0080	0.26	/CF	55	20	10										11000	CF	\$2,860.00		
	Structure's Vol. Demolished																	0.35	143	CY		
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY														143	CY	\$1,480.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price		4	/CY													143	CY	\$572.00	
	Subtotal																				\$4,912.00	
	Tank																					
	Dismantling Cost	9000 gal to 12000 gal tank	02115 200 0130	1225	Ea.											1	Ea.		1	Ea.	\$1,225.00	
	Loading Costs																					
	Transport Costs	9000 gal to 12000 gal tank	02115 200 1029	1100	Ea.											1			1	Ea.	\$1,100.00	
	Disposal Costs	9000 gal to 12000 gal tank	02115 200 0320	305	Ea.											1			1	Ea.	\$305.00	
	Subtotal																				\$2,630.00	
	Slab																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	20	55	0.5											20	CY	\$201.00	
	Demolition Cost																		1.3	26	CY	\$35.00
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															26	CY	\$84.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															26	CY	\$187.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															26	CY	\$507.00
	Subtotal																				\$507.00	
	Footings																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	150	2	1														
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															14	CY	\$19.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															14	CY	\$45.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															14	CY	\$101.00
	Subtotal																				\$278.00	
	Slab																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	20	20	0.5														
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																	
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																	
	Subtotal																				\$178.00	
	Walls																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	20	0.67	8.4														
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																	
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																	
	Subtotal																				\$40.00	
	Total																				\$8,600.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
17	Truck Pad 17																					
	Structure's Demolition Cost	Steel Bid, Large	02220 100 0012	0.25	CF																	
	Structure's Vol. Demolished																					
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel																					
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																					
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY						750					CF			28	CY	\$282.00	
	Concrete's Vol. Demolished																		1.3	36	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY															36	CY	\$49.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY															36	CY	\$116.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY															36	CY	\$259.00
	Subtotal																					\$706.00
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																					\$706.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost			
18	General Storage 18																						
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF	20	60	23								FT		27600	CF	\$6,800.00			
	Structure's Vol. Demolished																	0.35	358	CY			
	Rubble's Weight (exclude steel)																						
	Truck's Capacity																						
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY															358	CY	\$3,705.00	
	Transportation Cost Non Steel Truck																						
	Transportation Cost Non Steel Drive																						
	Disposal Cost Non Steel	City Services	City Service Price	4	/CY																358	CY	\$1,432.00
	Steel's Weight																						
	Truck's Capacity																						
	Haulage																						
	Transportation Cost Steel Truck																						
	Transportation Cost Steel Truck Drive																						
	Disposal Cost Steel																						
	Subtotal:																					\$12,037.00	
	Equipment's Disposal Cost																						
	Dismantling Cost																						
	Equipment's Vol. Demolished																						
	Loading Costs																						
	Transport Costs																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.05	/CY	20	67.5	0.67								FT				34	CY	\$342.00	
	Demolition Cost																				44	CY	\$59.00
	Concrete's Vol. Demolished																				44	CY	\$142.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																44	CY	\$317.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																44	CY	\$580.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																		
	Subtotal:																					\$580.00	
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Total:																					\$12,887.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
19	Reclaim Hopper Belt 19																					
	Structure's Demolition Cost																					
	Structure's Vol. Demolished																					
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel																					
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	<b>Subtotal</b>																					
	Equipment's Disposal Cost																					
	Dismantling Cost	Mechanical equipment heavy	15055 300 3600	745/ton								5			ton			5 ton			\$3,725.00	
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	<b>Subtotal</b>																					\$3,725.00
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	<b>Subtotal</b>																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	<b>Subtotal</b>																					
	<b>Total</b>																					\$3,725.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
20	Visual Disconnect 20																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost	Mechanical equipment heavy	15055 300 3600	745 /ton									1			ton			1 ton		\$745.00
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06 /CY		4	6	0.5								FT			1.3	0 CY	\$0.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35 /CY																	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23 /CY																	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2 /CY																	
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
21	New Shop 21																					
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF	20	62.5	20								FT		25000	CF	\$6,250.00		
	Structure's Vol. Demolished																	0.35	324	CY		
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY														324	CY	\$3,353.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price		/CY														324	CY	\$1,296.00	
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	<b>Subtotal</b>																				\$10,698.00	
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	<b>Subtotal</b>																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	20	62.5	0.5								FT		23	CY	\$231.00		
	Demolition Cost																	1.3	30	CY		
	Concrete's Vol. Demolished																					
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															30	CY	\$41.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															30	CY	\$97.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															30	CY	\$216.00
	<b>Subtotal</b>																				\$585.00	
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	<b>Subtotal</b>																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	<b>Subtotal</b>																					
	<b>Total</b>																				\$11,484.00	

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
22	Shop Extension 22																					
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	20	30	12								FT		7200	CF	\$1,800.00		
	Structure's Vol. Demolished																	0.35	93	CY		
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (18 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY															93	CY	\$963.00
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price		4															93	CY	\$372.00
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																					\$3,105.00
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	20	30	0.5								FT		11	CY	\$111.00		
	Concrete's Vol. Demolished																	1.3	14	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															14	CY	\$19.00
	Transportation Cost	12 CY (18 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															14	CY	\$45.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															14	CY	\$101.00
	Subtotal																					\$278.00
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																					\$3,411.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
23	Shotcrete Slopes 23																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY						46					CY		46	CY	\$463.00	
	Concrete's Vol. Demolished																	1.3	60	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY														60	CY	\$81.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY														60	CY	\$194.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY														60	CY	\$432.00
	Subtotal																				\$1,170.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$1,170.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
24	Fan Transformer 24																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	745 /ton								0.25				ton		0.25 ton		\$186.00
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			\$186.00
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06 /CY		6	8	0.67								FT		1.3	1 CY	\$10.00
	Concrete's Vol. Demolished																			
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35 /CY																1 CY
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23 /CY																1 CY
	Disposal Costs	Disposal on site	02220 550 4200	7.2 /CY																1 CY
	Subtotal																			\$21.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			\$207.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
25	Chain Link Fence 25																			
	Structure's Demolition Cost	Chain link remove 8'-10'	02220 875 0700	2.77 /LF		120										LF		120	LF	\$332.00
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	<b>Subtotal</b>																			\$332.00
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	<b>Total</b>																			\$332.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
26	Concrete Guard 26																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	530	2	3								FT		118	CY	\$1,187.00	
	Concrete's Vol. Demolished																	1.3	153	CY	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY														153	CY	\$207.00
	Transportation Cost	1/2 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY														153	CY	\$494.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY														153	CY	\$1,102.00
	Subtotal																				\$2,990.00
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	250	10	0.67									FT		62	CY	\$624.00
	Concrete's Vol. Demolished																	1.3	81	CY	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY														81	CY	\$109.00
	Transportation Cost	1/2 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY														81	CY	\$262.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY														81	CY	\$583.00
	Subtotal																				\$1,578.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$4,568.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
27	Retaining Wall 27																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	530	2	3								FT		118	CY	\$1,187.00	
	Concrete's Vol. Demolished																	1.3	153	CY	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY														153	CY	\$207.00
	Transportation Cost	12 CY (18 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY														153	CY	\$494.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY														153	CY	\$1,102.00
	Subtotal																				\$2,990.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$2,990.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
29	Guard Rail 29																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Remove Rails	Guiderail remove	D2220 875 0800	10.75	LF	120										LF		120	LF	\$1,290.00
	Remove Posts	Guide Posts Remove	D2220 875 0860	12.7	Ea											EA	10	EA	10	\$127.00
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			\$1,417.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			\$1,417.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
30	Inlets 30																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal:																				
	Equipment's Disposal Cost	Mechanical equipment heavy	15055 300 3600	745	ton							1				ton		1	ton	\$745.00	
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Cost																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal:																				\$745.00
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY							11				3		33	CY	\$332.00	
	Concrete's Vol. Demolished																	1.3		43	CY
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															43	CY
	Transportation Cost	12 CY (16 Ten) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															43	CY
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															43	CY
	Subtotal:																				\$538.00
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	4	6	0.67												1	CY
	Concrete's Vol. Demolished																			1.3	CY
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															1	CY
	Transportation Cost	12 CY (16 Ten) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															1	CY
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															1	CY
	Subtotal:																				\$21.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal:																				
	Total																				\$1,605.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
31	Sed Pond Culvert 31																				
	CMP 24	Excavation 1 CY backhoe earth	D2315 440 2040	12.3	12.3/CY	110	2	4								FT		33	CY	\$406.00	
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				\$406.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$406.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
02	Gabion Retaining Wall 32																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06/CY							2000					CF		74	CY	\$744.00	
	Concrete's Vol. Demolished																1.3	98	CY	\$981.00	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35/CY																\$130.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23/CY																\$310.00	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2/CY																\$691.00	
	Subtotal																				\$1,875.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$1,875.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
33	Water Wells 33																				
	Structure's Demolition Cost	Plug Well	AML3		5000 EA											4 EA			4 EA		\$20,000.00
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				\$20,000.00
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$20,000.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
34	Headwalls 34																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	19	18	0.5								FT		6	CY	\$60.00
	Concrete's Vol. Demolished																	8	CY	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	CY													8	CY	\$11.00
	Transportation Cost	1/2 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	CY													8	CY	\$26.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	CY													8	CY	\$58.00
	Subtotal																			\$155.00
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY						3600					CF		133	CY	\$1,338.00
	Concrete's Vol. Demolished																	173	CY	
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	CY													173	CY	\$234.00
	Transportation Cost	1/2 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	CY													173	CY	\$559.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	CY													173	CY	\$1,246.00
	Subtotal																			\$3,977.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Overhead Conveyor Supports 35																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal:																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal:																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06/CY		7	7	2								6FT		22 CY		\$221.00
	Concrete's Vol. Demolished																1.3	29 CY		\$39.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35/CY																\$29.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0350	3.23/CY																\$84.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2/CY																\$209.00
	Subtotal:																			\$593.00
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06/CY		2	2	4								6FT		4 CY		\$40.00
	Concrete's Vol. Demolished																1.3	5 CY		\$7.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35/CY																\$16.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23/CY																\$36.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2/CY																\$96.00
	Subtotal:																			\$199.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal:																			
	Total																			\$692.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost			
36	Reclaim Tunnel 36																						
	Structure's Demolition Cost																						
	Structure's Vol. Demolished																						
	Rubble's Weight (exclude steel)																						
	Truck's Capacity																						
	Haulage																						
	Transportation Cost Non Steel Truck																						
	Transportation Cost Non Steel Drive																						
	Disposal Cost Non Steel																						
	Steel's Weight																						
	Truck's Capacity																						
	Haulage																						
	Transportation Cost Steel Truck																						
	Transportation Cost Steel Truck Drive																						
	Disposal Cost Steel																						
	Subtotal:																						
	Equipment's Disposal Cost																						
	Dismantling Cost																						
	Equipment's Vol. Demolished																						
	Loading Costs																						
	Transport Costs																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition																						
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	170	12	1								FT				76	CY	\$765.00	
	Concrete's Vol. Demolished																			1.3	99	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																99	CY	\$134.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																99	CY	\$320.00
	Disposal Costs	Disposal on site	02220 350 4200	7.2	/CY																99	CY	\$713.00
	Subtotal:																						\$1,932.00
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Total																						\$1,932.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost			
37	Feeder Boxes 37																						
	Structure's Demolition Cost	Concrete Bld. Large	02220 100 0050	0.35	CF	13.5	16.5	8.5								3 FT		5680	CF	\$1,986.00			
	Structure's Vol. Demolished																	0.95	74	CY			
	Rubble's Weight (exclude steel)																						
	Truck's Capacity																						
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY															74	CY	\$766.00	
	Transportation Cost Non Steel Truck																						
	Transportation Cost Non Steel Drive																						
	Disposal Cost Non Steel	City Services	City Service Price		4	CY															74	CY	\$296.00
	Steel's Weight																						
	Truck's Capacity																						
	Haulage																						
	Transportation Cost Steel Truck																						
	Transportation Cost Steel Truck Drive																						
	Disposal Cost Steel																						
	Subtotal:																						\$3,050.00
	Equipment's Disposal Cost																						
	Dismantling Cost																						
	Equipment's Vol. Demolished																						
	Loading Costs																						
	Transport Costs																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	CY	8	5	0.5								3 FT				2	CY	\$20.00	
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY																		
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY																		
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY																		
	Subtotal:																						\$96.00
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Concrete Demolition																						
	Demolition Cost																						
	Concrete's Vol. Demolished																						
	Loading Cost																						
	Transportation Cost																						
	Disposal Costs																						
	Subtotal:																						
	Total																						\$3,108.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
38	Reclaim Conveyor Supports 38																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	4.5	4.5	1								2	FT	1.3	2	CY	\$20.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY																
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY																
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	2	4	2								2	FT	1.3	1	CY	\$10.00
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY																
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY																
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY																
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$77.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
39	Crusher Platform Supports 39																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment % Disposal Cost																				
	Dismantling Cost																				
	Equipment % Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	8	8	3								4 FT		28	CY	\$282.00	
	Concrete's Vol. Demolished																1.3	36	CY		
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY													36	CY	\$49.00	
	Transportation Cost	12 CY (16 Ten) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY													36	CY	\$116.00	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY													36	CY	\$259.00	
	Subtotal																				\$708.00
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	4	4	4								4 FT		9	CY	\$91.00	
	Concrete's Vol. Demolished																1.3	12	CY		
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY													12	CY	\$16.00	
	Transportation Cost	12 CY (16 Ten) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY													12	CY	\$38.00	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY													12	CY	\$86.00	
	Subtotal																				\$232.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$938.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
40	Feeder Conveyor Supports 40																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	4.5	4.5	1								2 FT		2 CY		\$20.00	
	Concrete's Vol. Demolished																1.3	3 CY			
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	CY													3 CY		\$4.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	CY													3 CY		\$10.00	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	CY													3 CY		\$22.00	
	Subtotal																			\$56.00	
	Concrete Demolition																				
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	2	4	2								2 FT		1 CY		\$10.00	
	Concrete's Vol. Demolished																1.3	1 CY			
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	CY													1 CY		\$1.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	CY													1 CY		\$3.00	
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	CY													1 CY		\$7.00	
	Subtotal																			\$21.00	
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$72.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
41	Scale Pads 41																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	<b>Subtotal:</b>																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	<b>Subtotal:</b>																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	20	20	0.5								2 FT		15 CY		\$151.00
	Concrete's Vol. Demolished																1.3	20 CY		
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY													20 CY		\$27.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY													20 CY		\$65.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY													20 CY		\$144.00
	<b>Subtotal:</b>																			\$387.00
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	12	60	1								2 FT		53 CY		\$533.00
	Concrete's Vol. Demolished																1.3	69 CY		
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY													69 CY		\$93.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY													69 CY		\$223.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY													69 CY		\$497.00
	<b>Subtotal:</b>																			\$1,348.00
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY	12	60	2								2 FT		107 CY		\$1,076.00
	Concrete's Vol. Demolished																1.3	139 CY		
	Loading Cost	Front end loader 3 CY	D2315 400 1300	1.35	/CY													139 CY		\$188.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	D2320 200 0320	3.23	/CY													139 CY		\$449.00
	Disposal Costs	Disposal on site	D2220 550 4200	7.2	/CY													139 CY		\$1,001.00
	<b>Subtotal:</b>																			\$2,714.00
	<b>Total:</b>																			\$4,447.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
42	New Scale House 42																					
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF	20	20	8								FT		3200	CF	\$800.00		
	Structure's Vol. Demolished																	0.35	41	CY		
	Rubbish's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	/CY															41	CY	\$424.00
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price		4	/CY														41	CY	\$164.00
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																					\$1,388.00
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	20	30	0.5								FT		11	CY	\$111.00		
	Demolition Cost																	1.3	14	CY		
	Concrete's Vol. Demolished																			14	CY	\$19.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															14	CY	\$45.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															14	CY	\$101.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																	\$278.00
	Subtotal																					\$278.00
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	3	8	1.5								FT		1.3	1	CY	\$10.00	
	Demolition Cost																			1	CY	\$1.00
	Concrete's Vol. Demolished																			1	CY	\$3.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															1	CY	\$7.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															1	CY	\$21.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																	\$21.00
	Subtotal																					\$21.00
	Concrete Demolition	Concrete demolition	ConcreteDemo1	10.06	/CY	0.68	80	0.68								FT		1.3	1	CY	\$10.00	
	Demolition Cost																			1	CY	\$1.00
	Concrete's Vol. Demolished																			1	CY	\$3.00
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															1	CY	\$7.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															1	CY	\$21.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																	\$21.00
	Subtotal																					\$21.00
	Total																					\$1,708.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
43	Proposed Bathhouse 43																					
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	60	100	18								FT		108000	CF	\$27,000.00		
	Structure's Vol. Demolished																0.35	1400	CY			
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY														1400	CY	\$14,480.00	
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price		4	CY													1400	CY	\$5,600.00	
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal:																				\$47,090.00	
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal:																					
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	60	100	0.5								FT		111	CY	\$1,117.00		
	Concrete's Vol. Demolished																	1.3	144	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY															144	CY	\$194.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY															144	CY	\$465.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY															144	CY	\$1,037.00
	Subtotal:																					\$2,813.00
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	3	320	1.5								FT		53	CY	\$533.00		
	Concrete's Vol. Demolished																	1.3	69	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY															69	CY	\$93.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY															69	CY	\$223.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY															69	CY	\$487.00
	Subtotal:																					\$1,346.00
	Concrete Demolition																					
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	CY	1	80	0.66								FT		2	CY	\$20.00		
	Concrete's Vol. Demolished																	1.3	3	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY															3	CY	\$4.00
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY															3	CY	\$10.00
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY															3	CY	\$22.00
	Subtotal:																					\$56.00
	Total																					\$51,305.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost		
44	Coal Silo 44								60	12						FT		6786	CF	\$1,697.00		
	Structure's Demolition Cost	Steel Bld. Large	D2220 100 0012	0.25	/CF													0.35	88	CY		
	Structure's Vol. Demolished																					
	Rubble's Weight (exclude steel)																					
	Truck's Capacity																					
	Haulage	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	D2320 200 0540	10.35	/CY															88	CY	\$911.00
	Transportation Cost Non Steel Truck																					
	Transportation Cost Non Steel Drive																					
	Disposal Cost Non Steel	City Services	City Service Price	4	/CY															88	CY	\$352.00
	Steel's Weight																					
	Truck's Capacity																					
	Haulage																					
	Transportation Cost Steel Truck																					
	Transportation Cost Steel Truck Drive																					
	Disposal Cost Steel																					
	Subtotal																					\$2,960.00
	Equipment's Disposal Cost																					
	Dismantling Cost																					
	Equipment's Vol. Demolished																					
	Loading Costs																					
	Transport Costs																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Concrete Demolition																					
	Demolition Cost																					
	Concrete's Vol. Demolished																					
	Loading Cost																					
	Transportation Cost																					
	Disposal Costs																					
	Subtotal																					
	Total																					\$2,960.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
45	Conveyors 45																				
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	CF	5	780	4								FT		15600	CF	\$3,900.00	
	Structure's Vol. Demolished																	0.35	202	CY	
	Rubble's Weight (exclude steel)																				
	Truck's Capacity	12 CY (16 Ton) Dump Truck 5 mi. rnd. trip	02320 200 0540	10.35	CY														202	CY	\$2,091.00
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	City Services	City Service Price	4	CY														202	CY	\$808.00
	Sleeve's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal:																				\$6,799.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal:																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal:																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal:																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal:																				
	Total:																				\$6,799.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
46	Parking Lot 46																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost	Pavement removal (asphalt) 3 inch	02220 875 1710	3.89	SY					4800						SY		4800	SY	\$18,672.00	
	Concrete's Vol. Demolished								0.25							FT	1.3	520	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY													520	CY	\$702.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY													520	CY	\$1,680.00	
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY													520	CY	\$3,744.00	
	Subtotal																			\$24,798.00	
	Concrete Demolition																				
	Demolition Cost	Pavement removal (asphalt) 3 inch	02220 875 1710	3.89	SY					4400						SY		4400	SY	\$17,116.00	
	Concrete's Vol. Demolished								0.25							FT	1.3	477	CY		
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	CY													477	CY	\$644.00	
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	CY													477	CY	\$1,541.00	
	Disposal Costs	Disposal on site	02220 550 4200	7.2	CY													477	CY	\$3,434.00	
	Subtotal																			\$22,735.00	
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$47,533.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
47	Rubberliner 47																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished	Mechanical equipment heavy	15055 300 3600		745/ton								32.5			ton			33 ton	\$24,585.00	
	Rubbish's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				\$24,585.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	xxxx																				
	Total																				\$24,585.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
48	Culvert Bedding Removal 48																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Stream Bed Sand																				
	Demolition Cost	Excavation 1 CY backhoe earth	02315 440 2040	12.3	/CY						1296					CY		1296	CY	\$15,941.00	
	Concrete's Vol. Demolished																	1.3	1685	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY															1685	CY
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY															1685	CY
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY															1685	CY
	Subtotal																				\$35,791.00
	Culvert Bed Sand																				
	Demolition Cost	Excavation 1 CY backhoe earth	02315 440 2040	12.3	/CY						3630										
	Concrete's Vol. Demolished																				
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY																1.3
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY																4719
	Disposal Costs	Disposal on site	02220 550 4200	7.2	/CY																4719
	Subtotal																				\$100,238.00
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	xxxx																				
	Total																				\$136,030.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	See Backfilling & Grading Plan																				
49	Off Site Dump Fee 49																				
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel	Nielson Construction Dirt	Nielson Dirt		1/TON						66096					CY		66096	CY	\$66,096.00	
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				\$66,096.00
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				\$25,096.00

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	See Backfilling and Grading																			
	Drainage Control 50																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Filter Material	Silt fence	D2370 550 1100	0.97	LF	3000										LF		3000	LF	\$2,910.00
	Rip-rap	Rip-Rap dumped 300 lbs. average	D2370 300 0370	27.5	Ton							2100				TON		2100	TON	\$57,750.00
	Subtotal																			\$60,660.00
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			\$60,660.00

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Shop 01																			\$31,902.00
	Ventilation Fan 02																			\$10,058.00
	Rock Dust Silo 03																			\$1,667.00
	Concrete Dump Pad 04																			\$10,778.00
	Power Center 05																			\$12,612.00
	Power Poles 06																			\$2,547.00
	Underground Bathhouse 07																			\$6,900.00
	Portals 08																			\$31,200.00
	Belt/Portals 09																			\$5,200.00
	Crusher Pad 10																			\$3,815.00
	Mine Belt 11																			\$2,235.00
	Silo 13																			\$40,043.00
	Weight Shed 14																			\$365.00
	Bulk Oil 15																			\$8,600.00
	Truck Pad 17																			\$706.00
	General Storage 18																			\$12,897.00
	Reclaim Hopper Belt 19																			\$3,725.00
	Visual Disconnect 20																			\$745.00
	New Shop 21																			\$11,484.00
	Shop Extension 22																			\$3,411.00
	Shotcrete Slopes 23																			\$1,170.00
	Fan Transformer 24																			\$207.00
	Chain Link Fence 25																			\$332.00
	Concrete Guard 26																			\$4,568.00
	Retaining Wall 27																			\$2,990.00
	Culverts 28																			\$58,118.00
	Guard Rail 29																			\$1,417.00
	Inlets 30																			\$1,805.00
	Sed Pond Culvert 31																			\$406.00
	Gabion Retaining Wall 32																			\$1,875.00
	Overhead Conveyor Supports 35																			\$652.00
	Reclaim Tunnel 36																			\$1,932.00
	Feeder Boxes 37																			\$3,106.00
	Reclaim Conveyor Supports 38																			\$77.00
	Crusher Platform Supports 39																			\$938.00
	Feeder Conveyor Supports 40																			\$77.00
	Scale Pads 41																			\$4,447.00
	New Scale House 42																			\$1,706.00
	Proposed Bathhouse 43																			
	Coal Silo 44																			\$2,960.00
	Conveyors 45																			\$6,799.00
	Parking Lot 46																			\$47,533.00
	Rubber Liner 47																			\$24,585.00
	Culvert Bedding Removal 48																			\$136,030.00
	Off Site Dump Fee 49																			\$66,096.00
	Drainage Control 50																			\$60,660.00
	<b>Total</b>																			<b>\$630,686.00</b>

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
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	Dismantling Cost																			
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
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	Disposal Cost Non Steel																			
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	<b>Subtotal</b>																			
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	Demolition Cost																			
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	Transportation Cost																			
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	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Total																				

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Demantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal:																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal:																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
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	Disposal Costs																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal:																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal:																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
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	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	<b>Subtotal</b>																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Transportation Cost																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	<b>Total</b>																				

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
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	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
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	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
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	Disposal Costs																			
	Subtotal																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
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	Dismantling Cost																				
	Equipment's Vol. Demolished																				
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	Concrete's Vol. Demolished																				
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	Demolition Cost																				
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	Structure's Demolition Cost																			
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	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
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	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
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	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
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	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
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	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
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	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
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	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
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	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
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	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	<b>Subtotal</b>																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	<b>Total</b>																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
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	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
	Transportation Cost Steel Truck																				
	Transportation Cost Steel Truck Drive																				
	Disposal Cost Steel																				
	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Transportation Cost																				
	Disposal Costs																				
	Subtotal																				
	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
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	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
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	Disposal Cost Steel																			
	<b>Subtotal</b>																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Disposal Costs																			
	<b>Subtotal</b>																			
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
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	Disposal Cost Non Steel																			
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	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
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	Loading Costs																			
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	Disposal Costs																			
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	Demolition Cost																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
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	Demolition Cost																			
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	Transportation Cost																			
	Disposal Costs																			
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	Truck's Capacity																			
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	Equipment's Disposal Cost																			
	Dismantling Cost																			
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	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
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	Transportation Cost Steel Truck Drive																			
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	Subtotal:																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
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	Demolition Cost																			
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	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	<b>Subtotal</b>																			
	<b>Total</b>																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
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	Truck's Capacity																				
	Haulage																				
	Transportation Cost Non Steel Truck																				
	Transportation Cost Non Steel Drive																				
	Disposal Cost Non Steel																				
	Steel's Weight																				
	Truck's Capacity																				
	Haulage																				
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	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
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	Transport Costs																				
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	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Transportation Cost																				
	Disposal Costs																				
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
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	Transportation Cost Non Steel Drive																			
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	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
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	Demolition Cost																			
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	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Subtotal																			
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	Disposal Cost Non Steel																				
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	Haulage																				
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	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
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	Transport Costs																				
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	Subtotal																				
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	Demolition Cost																				
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	Transportation Cost																				
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	Subtotal																				
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	Demolition Cost																				
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	Transportation Cost																				
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	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Transportation Cost																				
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
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	Disposal Cost Non Steel																			
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	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
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	Equipment's Disposal Cost																			
	Dismantling Cost																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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	Concrete's Vol. Demolished																			
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	Transportation Cost																			
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	Transport Costs																				
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	Subtotal																				
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	Demolition Cost																				
	Concrete's Vol. Demolished																				
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	Transportation Cost																				
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	Demolition Cost																				
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	Disposal Cost Non Steel																				
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	Subtotal																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
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	Demolition Cost																				
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	Haulage																			
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	Subtotal																			
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	Dismantling Cost																			
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	Transport Costs																			
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	Subtotal																			
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	Demolition Cost																			
	Concrete's Vol. Demolished																			
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	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
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	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
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	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
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	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
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	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
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	Transport Costs																			
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	Subtotal																			
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	Demolition Cost																			
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	Transportation Cost																			
	Disposal Costs																			
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	Transportation Cost																			
	Disposal Costs																			
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	Demolition Cost																			
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	Subtotal																			
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	Demolition Cost																			
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	Transportation Cost																			
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	Subtotal:																			
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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Crandell Canyon Mine Backfilling and Grading															
Ripping Fill Area (D9 Dozer)															
DGR Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26\$/HR		57387	CY	1473	CY/HR	39	HR	\$8,863.00
Multi-Shank Ripper 360-519 P (9-49) (3Q02)	2580	7.65	0.1		24.54	1	24.54\$/HR						39	HR	\$957.00
Subtotal															\$9,820.00
Backfill On Site															
Loading															
988F Series II 2000 EROPS (9-27) (3Q02)	12710	54.35	0.1	49.35	188.57	1	188.57\$/HR		70192	CY	498	CY/HR	140.9	HR	\$26,570.00
Hauling															
769D (20-1) (2Q02)	10640	39.75	0.1	39.15	149.38	2	298.76\$/HR		70192	CY	498	CY/HR	140.9	HR	\$42,095.00
Place with Excavator															
CAT 375L 2001 (10-8)(3Q02)	23630	83.6	0.1	49.35	289	1	289\$/HR		12805	CY	181.3	CY/HR	70.6	HR	\$20,403.00
Place with Dozer															
DGR Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26\$/HR		57387	CY	215	CY/HR	286.9	HR	\$60,656.00
Subtotal															\$149,724.00
Backfill Off Site															
Loading															
988F Series II 2000 EROPS (9-27) (3Q02)	12710	54.35	0.1	49.35	188.57	1	188.57\$/HR		66096	CY	583	CY/HR	113.4	HR	\$21,384.00
Hauling															
BX4 85,000lbs 15-18 CY (20-1) (2Q02)	4430	25.2	0.1	39.15	94.56	17	1607.52\$/HR		66096	CY	583	CY/HR	113.4	HR	\$182,293.00
Subtotal															\$203,677.00
Miscellaneous Removal/Excavate Stream Channels															
436B (4WD) Ext. 2000 EROPS (9-17) (3Q02)	3575	13.75	0.1	49.35	86.82	1	86.82\$/HR		1560	CY	151.1	CY/HR	10.3	HR	\$894.00
Subtotal															\$894.00
Total Backfilling and Grading															\$364,115.00

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dia.	Units	Cost
Crandell Canyon Mine															
Topssoil Distribution															
Load From Topssoil Stockpile															
Load															
966F Series II EROPS 1999 (9-27) (3Q02)	6295	25.25	0.1	49.35	116.47	1	116.47 \$/HR		10737 CY		298.8 CY/HR		35.9 HR		\$4,181.00
Haul															
BX4 50,000lbs 10-12 CY (20-1) (2Q02)	2855	18.25	0.1	39.15	77.07	5	385.35 \$/HR		10737 CY		298.8 CY/HR		35.9 HR		\$13,834.00
Subtotal															\$18,015.00
Place Topssoil					38.5	0.5	19.25 \$/HR						35.9 HR		\$691.00
Place with Wheel Loader															
966F Series II EROPS 1999 (9-27) (3Q02)	6295	25.25	0.1	49.35	116.47	1	116.47 \$/HR		7354 CY		160.1 CY/HR		45.9 HR		\$5,346.00
Grading															
D7R Semi-U (9-43) (3Q02) 2001	10335	35.55	0.1	49.35	153.05	1	153.05 \$/HR		7354 CY		145 CY/HR		50.7 HR		\$7,760.00
Excavator															
CAT 375L 2001 (10-8)(3Q02)	23630	83.6	0.1	49.35	289	1	289 \$/HR		3383 CY		181.3 CY/HR		18.7 HR		\$5,404.00
Subtotal															\$19,201.00
Total															\$37,216.00

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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Crandell Canyon Mine Support Equipment and Labor															
Backfilling															
5,000 gal H2O truck Diesel (20-6) (2Q02)	4895	27.15	0.1	39.15	99.61	1	99.61 \$/HR						306 HR		30481
Pickup Truck Crew 4x4 1 ton (20-7) (2Q02)	880	3.85	0.1	0	9.74	1	9.74 \$/HR						306 HR		2980
Foreman Average, Outside				53.65			53.65 \$/HR						306 HR		16417
Subtotal															49878
Total															49878

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	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Crandell Canyon Mine															
Earthwork Costs															
Backfilling and Grading															364115
Topsoll Distribution															37216
Support Equipment and Labor															49878
<b>Total</b>															<b>451209</b>

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment's Disposal Cost																			
	Dismantling Cost																			
	Equipment's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
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	Subtotal																			
	Total																			

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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
	Structure's Vol. Demolished																				
	Rubble's Weight (exclude steel)																				
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	Disposal Cost Steel																				
	<b>Subtotal</b>																				
	Equipment's Disposal Cost																				
	Dismantling Cost																				
	Equipment's Vol. Demolished																				
	Loading Costs																				
	Transport Costs																				
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	Concrete Demolition																				
	Demolition Cost																				
	Concrete's Vol. Demolished																				
	Loading Cost																				
	Transportation Cost																				
	Disposal Costs																				
	<b>Subtotal</b>																				
	<b>Total</b>																				

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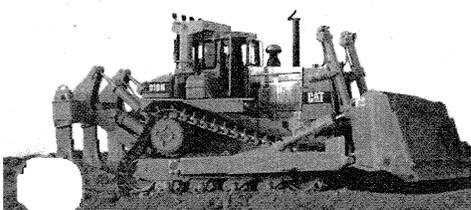
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Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost	
	Structure's Demolition Cost																				
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	Subtotal																				
	Total																				

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# Nielson Construction

G E N E R A L   C O N T R A C T O R S

P.O. Box 620 • 825 North Loop Road • Huntington, Utah 84528  
(435) 687-2494 • Fax (435) 687-9721

750 East Ridge Road • Price, Utah 84501  
(435) 636-0303

May 21, 2003

Genwal Resources  
Dave Shaver  
Project Engineer  
P.O. 1077  
Price, Utah 84501

R.E. Crandall Canyon Reclamation

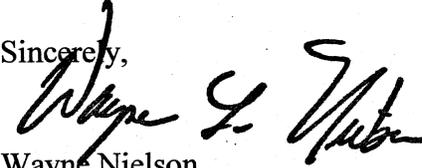
Dear Mr. Shaver,

Nielson Construction has two sites in Huntington Canyon where the excess material that will be generated during Crandall Canyon Reclamation can be disposed of. One is our gravel pit where the asphalt plant is located. The other is one mile closer to Huntington on the north side of the highway. We have a yard where we store various materials. We would handle any excess material from Crandall Canyon in these two sites for a \$1.00 per cubic yard disposal fee.

Any solid waste that needs to be disposed of off site could be hauled to our landfill next to the Emery County Landfill. We have a \$12.00/ton disposal fee at this facility.

These prices would also apply to any other entity performing reclamation of the Genwal Mine site.

Sincerely,



Wayne Nielson  
Nielson construction

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*Equal Employment Opportunity Company*

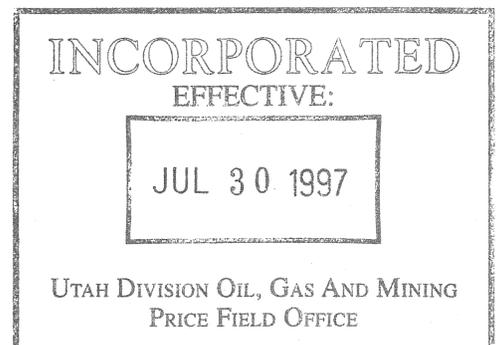
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**APPENDIX 5-20**  
**RECLAMATION COST ESTIMATE**  
**FOR BOND AMOUNT**

April 22, 1997



An estimate of the costs to reclaim the disturbed surface of Genwal's permitted area is presented in this appendix.

The primary sources of the unit costs for this estimate are from DataQuest's Rental Rate Blue Book and R.S. Means' Heavy Construction Cost Data. The demolition and disposal of the surface equipment and facilities comes from Section 020 of Mean's. The items which can be disposed inside the mine portals have no dump fee included, otherwise the demolished items will be disposed in an approved landfill (Nielson's). The items to be demolished are shown on the Facilities Map.

The earthwork estimates for backfilling, grading and soil distribution was based on Caterpillar Handbook production rates, DataQuest's Rental Rate Blue Book equipment rental rates and operating costs and the Means' Labor Rates Table from inside the back cover. Earthwork volumes come from the mass-balance tables for reclamation (and cross-sections shown on Plates 5-17a & 5-17b).

The general costs also come from Means and include laborers, foremen, pickups, water trucks etc.

The revegetation costs are based upon quotes, the disturbed area, the permitted application rates.

The 10-Year monitoring costs are based upon the permitted sampling sites and frequencies and the lab costs charged by CT& E in Huntington.

The costs are in 1997 dollars and are escalated from 1997 to 1998, which is the permit renewal date.

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	MAP ON STORAGE AREA IN MINE WORKINGS

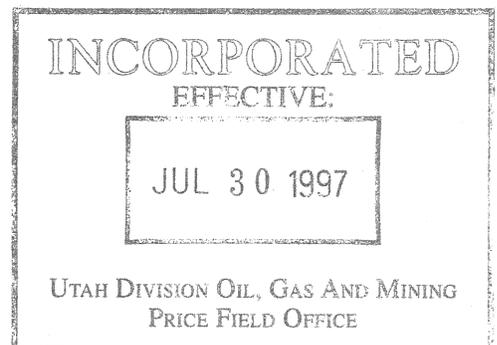
April 22, 1997



**TABLE 5-20-1****TOTAL RECLAMATION COST FOR BONDING**

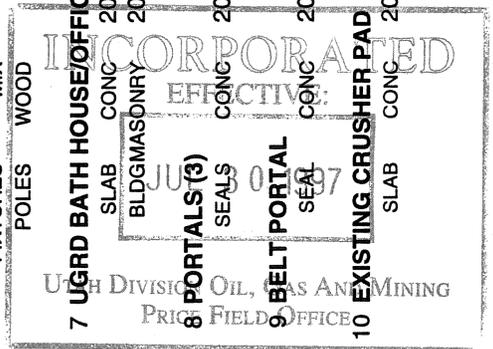
<u>ITEM</u>		<u>CALC AMT</u>	<u>ADJ AMT</u>
1 DEMOLITION (TABLE 5-20-2)		\$608,063	\$529,015
2 BACKFILL & GRADE (TABLE 5-20-3)		\$296,189	\$296,189
3 SOIL DISTRIBUTION (TABLE 5-20-4)		\$31,473	\$27,382
4 GENERAL (TABLE 5-20-5)		\$115,993	\$100,914
5 REVEGETATION (TABLE 5-20-6)		\$23,608	\$23,608
6 10 YR MONITORING (TABLE 5-20-7)		\$107,748	\$107,748
<b>SUBTOTAL</b>		<b>\$1,183,074</b>	<b>\$1,084,855</b>
<b>CONTINGENCY</b>	10.00%		\$108,486
<b>ENGINEERING</b>	5.00%		\$54,243
<b>TOTAL</b>			<b>\$1,247,584</b>
<b>ESCALATION TO 1998</b>	1.42% PER YEAR	1.42%	\$17,716
<b>GRAND TOTAL RECLAMATION COST</b>			<b>\$1,265,299</b>
<b>ESTIMATED BOND AMOUNT</b>			<b>\$1,266,000</b>

NOTE: Adjustment made to reduce MEANS National Average Costs to Utah Average Costs



**TABLE 5-20-2  
DEMOLITION & DISPOSAL COSTS**

ITEM	DEMOLITION				DISPOSAL				DUMP FEE				TOTAL				
	TYPE	WIDTH	LENGTH	HEIGHT	AMOUNT	UNIT	COST	AMOUNT	UNIT	COST	AMOUNT	UNIT		COST			
<b>1 SHOP, WAREHOUSE &amp; OFFICE BUILDING</b>																	
SLAB	CONC	20	160	0.5	3200	SQ FT	\$4.39	\$14,048	77.0	CU YD	\$6.55	\$505	0.0	CU YD	\$4.17	\$0	\$14,553
BLDG	METAL	20	160	20	64000	CU FT	\$0.23	\$14,720	782.2	CU YD	\$8.15	\$6,375	782.2	CU YD	\$4.17	\$3,262	\$24,357
<b>2 VENTILATION FANS &amp; STRUCTURE</b>																	
SLAB	CONC	20	60	0.5	1200	SQ FT	\$4.39	\$5,268	28.9	CU YD	\$6.55	\$189	0.0	CU YD	\$4.17	\$0	\$5,457
BLDG	METAL	20	60	16.67	20000	CU FT	\$0.23	\$4,600	244.4	CU YD	\$8.15	\$1,992	244.4	CU YD	\$4.17	\$1,019	\$7,612
<b>3 ROCKDUST SILO</b>																	
FOOTINGS	CONC	2	3	2	12	LN FT	\$19.45	\$233	0.6	CU YD	\$6.55	\$4	0.0	CU YD	\$4.17	\$0	\$237
SILO	STEEL	12	DIA	30.00	3391	CU FT	\$0.23	\$780	41.4	CU YD	\$8.15	\$338	41.4	CU YD	\$4.17	\$173	\$1,291
<b>4 CONCRETE DUMPSTER PAD</b>																	
SLAB	CONC	25	30	1	750	SQ FT	\$7.98	\$5,985	36.1	CU YD	\$6.55	\$237	0.0	CU YD	\$4.17	\$0	\$6,222
PAVEMENT	ASPHALT	130	135	0.25	1950	SQ YD	\$4.08	\$7,956	211.3	CU YD	\$6.55	\$1,384	0.0	CU YD	\$4.17	\$0	\$9,340
<b>5 SUBSTATION</b>																	
SLAB	CONC	21	25	0.67	525	SQ FT	\$7.98	\$4,190	16.9	CU YD	\$6.55	\$111	0.0	CU YD	\$4.17	\$0	\$4,300
FENCE	STEEL	30	30	10	120	LN FT	\$2.39	\$287	11.1	CU YD	\$6.55	\$73	0.0	CU YD	\$4.17	\$0	\$360
TRANSFORMER	EQUIP		3750	KVA	5	EA	\$800	\$4,000	30.0	CU YD	\$8.15	\$245	30.0	CU YD	\$4.17	\$125	\$4,370
DISCONNECTS	EQUIP				2	TON	\$615	\$1,230	2.0	CU YD	\$8.15	\$16	2.0	CU YD	\$4.17	\$8	\$1,255
UGRD WIRE	COND				9	C.L.F.	\$36.00	\$324	2.0	CU YD	\$8.15	\$16	0.0	CU YD	\$4.17	\$0	\$340
AERIAL WIRE	COND				5	C.L.F.	\$42.50	\$213	1.0	CU YD	\$8.15	\$8	0.0	CU YD	\$4.17	\$0	\$221
<b>6 POWER LINE</b>																	
AERIAL WIRE	COND				1.8	C.L.F.	\$11.05	\$20	30.0	CU YD	\$8.15	\$245	0.0	CU YD	\$4.17	\$0	\$264
CONDUIT	METAL				100	LN FT	\$1.53	\$153	2.0	CU YD	\$8.15	\$16	2.0	CU YD	\$4.17	\$8	\$178
FIXTURES	MIX				6	EA	\$52	\$312	2.0	CU YD	\$8.15	\$16	2.0	CU YD	\$4.17	\$8	\$337
POLES	WOOD				6	EA	\$116	\$696	1.0	CU YD	\$8.15	\$8	1.0	CU YD	\$4.17	\$4	\$708
<b>7 UGRD BATH HOUSE/OFFICE</b>																	
SLAB	CONC	20	70	0.5	1400	SQ FT	\$4.39	\$6,146	33.7	CU YD	\$6.55	\$221	0.0	CU YD	\$4.17	\$0	\$6,367
BLDG	MASONRY	20	70	10.00	14000	CU FT	\$0.23	\$3,220	171.1	CU YD	\$8.15	\$1,395	171.1	CU YD	\$4.17	\$714	\$5,328
<b>8 PORTALS(3)</b>																	
SEALS	CONC	20	3	7	3	EA	\$3,300	\$9,900									\$9,900
<b>9 BELT PORTAL</b>																	
SEAL	CONC	20	3	7	1	EA	\$3,300	\$3,300									\$3,300
<b>10 EXISTING CRUSHER PAD</b>																	
SLAB	CONC	20	36	1	720	SQ FT	\$7.98	\$5,746	34.7	CU YD	\$6.55	\$227	0.0	CU YD	\$4.17	\$0	\$5,973



**TABLE 5-20-2  
DEMOLITION & DISPOSAL COSTS**

ITEM	DEMOLITION				DISPOSAL				DUMP FEE			TOTAL				
	TYPE	WIDTH	LENGTH	HEIGHT	AMOUNT	UNIT	COST	AMOUNT	UNIT	COST	AMOUNT		UNIT	COST		
<b>11 MINE BELT CONVEYOR</b>																
MECH EQUIPT			2.5	TON	\$615		\$1,538	55.0	CU YD	\$8.15	\$448	55.0	CU YD	\$4.17	\$229	\$2,215
<b>15 BULK OIL STATION</b>																
SLAB CONC	20	55	0.5		\$4.39	1100	\$4,829	26.5	CU YD	\$6.55	\$173	0.0	CU YD	\$4.17	\$0	\$5,002
FOOTINGS CONC	1	150	2		\$19.45	150	\$2,918	14.4	CU YD	\$6.55	\$95	0.0	CU YD	\$4.17	\$0	\$3,012
BLDG MASONRY	20	55	10.00		\$0.23	11000	\$2,530	134.4	CU YD	\$8.15	\$1,096	134.4	CU YD	\$4.17	\$561	\$4,186
SLAB CONC	20	20	0.5		\$4.39	400	\$1,756	9.6	CU YD	\$6.55	\$63	0.0	CU YD	\$4.17	\$0	\$1,819
WALLS CONC	0.67	20	8.4		\$10.65	168	\$1,789	5.4	CU YD	\$6.55	\$35	0.0	CU YD	\$4.17	\$0	\$1,825
TANK STEEL		1		EA	\$2,200		\$2,200	0.0	CU YD	\$8.15	\$0	0.0	CU YD	\$4.17	\$0	\$2,200
<b>18 GENERAL STORAGE FACILITY</b>																
SLAB CONC	20	67.5	0.67		\$5.61	1350	\$7,574	43.6	CU YD	\$6.55	\$285	0.0	CU YD	\$4.17	\$0	\$7,859
BLDG METAL	20	60	2.33		\$0.23	2800	\$644	34.2	CU YD	\$8.15	\$279	34.2	CU YD	\$4.17	\$143	\$1,066
<b>20 VISUAL DISCONNECT</b>																
SLAB CONC	4	6	0.5		\$4.39	24	\$105	0.6	CU YD	\$8.15	\$5	0.0	CU YD	\$4.17	\$0	\$110
ELECT BOX METAL		1		EA	\$275		\$275	1.0	CU YD	\$8.15	\$8	1.0	CU YD	\$4.17	\$4	\$287
<b>21 NEW SHOP, WAREHOUSE &amp; OFFICE BUILDING</b>																
SLAB CONC	20	62.5	0.5		\$4.39	1250	\$5,488	30.1	CU YD	\$6.55	\$197	0.0	CU YD	\$4.17	\$0	\$5,685
BLDG METAL	20	62.5	20		\$0.23	25000	\$5,750	305.6	CU YD	\$8.15	\$2,490	305.6	CU YD	\$4.17	\$1,274	\$9,514
<b>22 SHOP EXTENSION</b>																
SLAB CONC	20	30	0.5		\$4.39	600	\$2,634	14.4	CU YD	\$6.55	\$95	0.0	CU YD	\$4.17	\$0	\$2,729
BLDG METAL	20	30	12		\$0.23	7200	\$1,656	88.0	CU YD	\$8.15	\$717	88.0	CU YD	\$4.17	\$367	\$2,740
<b>23 SHOTCRETE SLOPES</b>																
SLOPE CONC	SEE MAP FOR AREA	2"			\$2.90	7420	\$21,518	60.0	CU YD	\$6.55	\$393	0.0	CU YD	\$4.17	\$0	\$21,911
<b>24 FAN TRANSFORMER</b>																
SLAB CONC	6	8	0.67		\$4.39	48	\$211	1.5	CU YD	\$6.55	\$10	0.0	CU YD	\$4.17	\$0	\$221
TRANSFORME METAL		0.25		TON	\$805		\$201	9.0	CU YD	\$8.15	\$73	1.0	CU YD	\$4.17	\$4	\$279
<b>25 CHAIN LINK FENCE</b>																
FENCE STEEL	0.1	120	4		\$2.39	120	\$287	4.4	CU YD	\$6.55	\$29	0.0	CU YD	\$4.17	\$0	\$316
<b>26 CONCRETE GUARD</b>																
MEDIAN BARRIER (TEMP.)	2	530	3		\$8.15	530	\$4,320	0.0	CU YD	\$6.55	\$0	118.0	CU YD	\$4.17	\$492	\$4,812
WALL CONC	10	250	0.67		\$10.65	2500	\$26,625	80.6	CU YD	\$6.55	\$528	0.0	CU YD	\$4.17	\$0	\$27,153

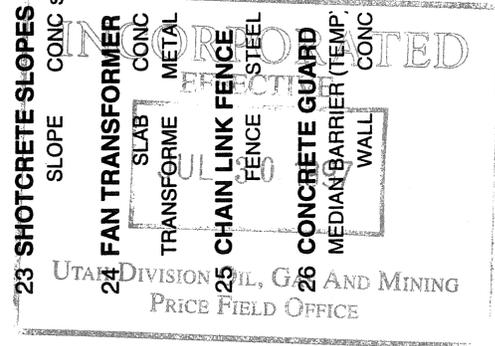


TABLE 5-20-2  
DEMOLITION & DISPOSAL COSTS

ITEM	TYPE	WIDTH	LENGTH	HEIGHT	DEMOLITION			DISPOSAL			DUMP FEE			TOTAL				
					AMOUNT	UNIT	COST	AMOUNT	UNIT	COST	AMOUNT	UNIT	COST					
27	RETAINING WALL																	
	WALL	CONC	10	192	1	1920	SQ FT	\$14.90	\$28,608	92.4	CU YD	\$6.55	\$606	0.0	CU YD	\$4.17	\$0	\$29,214
28	CULVERTS																	
	UD-1	CMP	42			295	LN FT	\$26.33	\$7,767	34.7	CU YD	\$6.55	\$227	34.7	CU YD	\$4.17	\$145	\$8,139
	C2 C4 C8 C10	CMP	24			600	LN FT	\$4.92	\$2,952	23.0	CU YD	\$6.55	\$151	23.0	CU YD	\$4.17	\$96	\$3,199
	C1	CMP	18			60	LN FT	\$4.39	\$263	5.1	CU YD	\$6.55	\$33	5.1	CU YD	\$4.17	\$21	\$318
	C12	CMP	15			85	LN FT	\$4.39	\$373	5.0	CU YD	\$6.55	\$33	5.0	CU YD	\$4.17	\$21	\$427
	C3 C7 C9 C11	CMP	12			251	LN FT	\$4.39	\$1,102	9.5	CU YD	\$6.55	\$62	9.5	CU YD	\$4.17	\$40	\$1,204
	UD-3	PVC	18			500	LN FT	\$4.39	\$2,195	10.8	CU YD	\$6.55	\$71	10.8	CU YD	\$4.17	\$45	\$2,311
	C-5	PVC	12			120	LN FT	\$4.39	\$527	4.5	CU YD	\$6.55	\$30	4.5	CU YD	\$4.17	\$19	\$575
	BYPASS	CMP	24			1400	LN FT	\$4.92	\$6,888	53.7	CU YD	\$6.55	\$352	53.7	CU YD	\$4.17	\$224	\$7,464
	MAIN CREEK	CMP	72			1400	LN FT	\$45.14	\$63,196	483.6	CU YD	\$6.55	\$3,167	483.6	CU YD	\$4.17	\$2,016	\$68,380
29	GUARD RAIL																	
	RAIL	STEEL				150	LN FT	\$6.05	\$908	4.0	CU YD	\$6.55	\$26	4.0	CU YD	\$4.17	\$17	\$950
	POSTS	WOOD				10	EA	\$16.15	\$162	5.0	CU YD	\$6.55	\$33	5.0	CU YD	\$4.17	\$21	\$215
30	INLETS																	
	DROP INLETS	CONC				3	EA	\$250.00	\$750	0.0	CU YD	\$6.55	\$0	0.0	CU YD	\$4.17	\$0	\$750
	UD1	STEEL				1	EA	\$150.00	\$150	1.0	CU YD	\$6.55	\$7	1.0	CU YD	\$4.17	\$4	\$161
	UD3	CONC	4	6	0.67	24	SQ FT	\$10.65	\$256	0.8	CU YD	\$6.55	\$5	0.0	CU YD	\$4.17	\$0	\$261
31	SED POND RISER & CULVERT																	
	CMP		24			110	LN FT	\$4.92	\$541	0.0	CU YD	\$6.55	\$0	0.0	CU YD	\$4.17	\$0	\$541
32	GABION RETAINING WALL																	
	STONE					2000	CU FT	\$4.69	\$9,387	0.0	CU YD	\$6.55	\$0	0.0	CU YD	\$4.17	\$0	\$9,387
33	SEAL WATER WELLS																	
						4	EA	\$373.80	\$1,495									\$1,495
34	HEADWALLS - CULVERT INLET AND OUTLET																	
	INLET	CONC	18	0.5		324	SQ FT	\$2.17	\$703	7.8	CY	\$6.55	\$51	0.0	CY	\$4.17	\$0	\$754
	GABION OUTLET	STONE	12	64	VARIES	3600	CU FT	\$4.69	\$16,884	0.0	CU YD	\$6.55	\$0	0.0	CU YD	\$4.17	\$0	\$16,884
35	OVERHEAD CONVEYOR SUPPORTS (6)																	
	SLAB	CONC	7	7	2	42	LN FT	\$19.45	\$817	28.3	CY	\$6.55	\$185	0.0	CY	\$4.17	\$0	\$1,002
	PILLARS	CONC	2	2	4	24	LN FT	\$19.45	\$467	4.6	CY	\$6.55	\$30	0.0	CY	\$4.17	\$0	\$497
36	RECLAIM TUNNEL																	
	SLAB	CONC	12	170	1	2040	SQ FT	\$14.90	\$30,396	98.2	CY	\$6.55	\$643	0.0	CY	\$4.17	\$0	\$31,039

**TABLE 5-20-2  
DEMOLITION & DISPOSAL COSTS**

ITEM	TYPE	WIDTH	LENGTH	HEIGHT	DEMOLITION			DISPOSAL			DUMP FEE			TOTAL			
					AMOUNT	UNIT	COST	AMOUNT	UNIT	COST	AMOUNT	UNIT	COST				
<b>37 FEEDER BOXES (3)</b>																	
BOXES	CONC	13.5	16.5	8.5	5680	CU FT	\$0.19	\$1,079	273.5	CY	\$6.55	\$1,791	0.0	CY	\$4.17	\$0	\$2,871
FOOTINGS	CONC	5	8	5	24	LIN FT	\$19.45	\$467	28.9	CY	\$6.55	\$189	0.0	CY	\$4.17	\$0	\$656
<b>38 RECLAIM CONVEYOR SUPPORTS (2)</b>																	
PILLARS	CONC	4.5	4.5	1	9	LIN FT	\$19.45	\$175	2.0	CY	\$6.55	\$13	0.0	CY	\$4.17	\$0	\$188
FOOTINGS	CONC	2	4	2	8	LIN FT	\$19.45	\$156	1.5	CY	\$6.55	\$10	0.0	CY	\$4.17	\$0	\$165
<b>39 CRUSHER PLATFORM SUPPORTS (4)</b>																	
SLAB	CONC	8	8	3	256	SQ FT	\$14.90	\$3,814	37.0	CY	\$6.55	\$242	0.0	CY	\$4.17	\$0	\$4,057
PILLARS	CONC	4	4	4	16	LIN FT	\$19.45	\$311	12.3	CY	\$6.55	\$81	0.0	CY	\$4.17	\$0	\$392
<b>40 FEEDER CONVEYOR SUPPORTS (2)</b>																	
PILLARS	CONC	4.5	4.5	1	9	LIN FT	\$19.45	\$175	2.0	CY	\$6.55	\$13	0.0	CY	\$4.17	\$0	\$188
PILLARS	CONC	2	4	2	8	LIN FT	\$19.45	\$156	1.5	CY	\$6.55	\$10	0.0	CY	\$4.17	\$0	\$165
<b>41 SCALE PADS AND SUPPORTS (2)</b>																	
PAD	CONC	20	20	0.5	800	SQ FT	\$4.39	\$3,512	19.3	CY	\$6.55	\$126	0.0	CY	\$4.17	\$0	\$3,638
RAMPS	CONC	12	60	1	1440	SQ FT	\$8.32	\$11,981	69.3	CY	\$6.55	\$454	0.0	CY	\$4.17	\$0	\$12,435
FOOTINGS	CONC	12	60	2	240	LIN FT	\$19.45	\$4,668	138.7	CY	\$6.55	\$908	0.0	CY	\$4.17	\$0	\$5,576
<b>42 NEW SCALE HOUSE</b>																	
PAD	CONC	20	20	0.5	400	SQ FT	\$4.39	\$1,756	9.6	CY	\$6.55	\$63	0.0	CY	\$4.17	\$0	\$1,819
FOOTINGS	CONC	3	80	1.5	80	LIN FT	\$19.45	\$1,556	17.3	CY	\$6.55	\$114	0.0	CY	\$4.17	\$0	\$1,670
STEM WALL	CONC	0.66	80	0.66	52.8	SQ FT	\$10.65	\$562	1.7	CY	\$6.55	\$11	0.0	CY	\$4.17	\$0	\$573
BUILDING	METAL	20	20	8	3200	CU FT	\$0.23	\$736	39.1	CY	\$8.15	\$319	39.1	CY	\$4.17	\$163	\$1,218
<b>43 PROPOSED BATH HOUSE</b>																	
PAD	CONC	60	100	0.5	6000	SQ FT	\$4.39	\$26,340	144.4	CY	\$6.55	\$946	0.0	CY	\$4.17	\$0	\$27,286
FOOTINGS	CONC	3	320	1.5	320	LIN FT	\$19.45	\$6,224	69.3	CY	\$6.55	\$454	0.0	CY	\$4.17	\$0	\$6,678
STEM WALL	CONC	1	80	0.66	80	SQ FT	\$10.65	\$852	2.5	CY	\$6.55	\$17	0.0	CY	\$4.17	\$0	\$869
BUILDING	METAL	60	100	18	108000	CU FT	\$0.23	\$24,840	1320.0	CY	\$8.15	\$10,758	1320.0	CY	\$4.17	\$5,504	\$41,102
<b>44 COAL SILO</b>																	
	STEEL	12	DIA	60	6782	CU FT	\$0.23	\$1,560	82.9	CY	\$8.15	\$676	82.9	CY	\$4.17	\$346	\$2,581
<b>45 CONVEYORS</b>																	
	STEEL	5	780	4	15600	CU FT	\$0.23	\$3,588	190.7	CY	\$8.15	\$1,554	190.7	CY	\$4.17	\$795	\$5,937
<b>46 PARKING LOT</b>																	
EXISTING PAD	ASPHALT				4800	SQ YD	\$4.08	\$19,584	520.0	CY	\$6.55	\$3,406	0.0	CU YD	\$4.17	\$0	\$22,990
PROPOSED PADS	ASPHALT				4400	SQ YD	\$4.08	\$17,952	520.0	CY	\$6.55	\$3,406	0.0	CU YD	\$4.17	\$0	\$21,358

TABLE 5-20-2  
DEMOLITION & DISPOSAL COSTS

ITEM	TYPE	WIDTH	LENGTH	HEIGHT	DEMOLITION			DISPOSAL			DUMP FEE			TOTAL		
					AMOUNT	UNIT	COST	AMOUNT	UNIT	COST	AMOUNT	UNIT	COST			
47 RUBBER LINER REMOVAL	RUBBER FABRIC	25	1400	10 MIL	1400	LIN FT	\$1.96	32.5	TON	\$6.55	\$213	32.5	CY	\$4.17	\$136	\$3,099
48 72" CULVERT BEDDING MATERIAL REMOVAL BY VACUUM																
STREAM BED	SAND	5	1400	5	1296.3	CU YD	\$1.20	1296.3	CY	\$6.55	\$8,491	0.0	CY	\$4.17	\$0	\$10,046
CULVERT BED	SAND	10	1400	10	3629.6	CU YD	\$1.20	3629.6	CY	\$6.55	\$23,774	0.0	CY	\$4.17	\$0	\$28,130
<b>TOTALS</b>							\$505,663			\$84,391	\$18,008					\$608,063

BASED UPON MEANS REFERENCES EXCEPT FOR DUMP FEE  
DUMP FEE SET BY STATE AGENCY (NIELSON'S LANDFILL)  
ITEMS WITH NO DUMP FEE ARE DISPOSED INSIDE OF MINE PORTALS

**TABLE 5-20-3**

**BACKFILLING AND GRADING**

	<u>BANK</u> <u>VOLUME</u>	<u>LOOSE</u> <u>VOLUME</u>	<u>PROD</u> <u>RATE</u>	<u>#</u> <u>UNITS</u>	<u>CALC</u> <u>AMOUNT</u>	<u>ESTIM</u> <u>AMOUNT</u>	<u>UNIT</u>	<u>---UNIT COST---</u> <u>EQUIP</u> <u>LABOR</u>		<u>TOTAL</u>
<b>RIPPING (D9 Dozer)</b>										
FILL AREA	33,437	43,468	2350	1	18.50	20 HOURS		\$121.81	\$38.35	\$3,203
FINAL SURFACE	14,500	18,850	2350	1	8.02	9 HOURS		\$121.81	\$38.35	\$1,441
<b>LOADING (7 cy 988 Loader)</b>										
	101,326	131,724	430	1	306.33	300 HOURS		\$78.09	\$38.35	\$34,932
<b>HAULING (34 cy Trucks, Scoops, Tandem Trailers )</b>										
BACKFILL AREA	53,994	70,192	200	3	351.0	360 HOURS		\$68.76	\$31.14	\$35,964
MINE WORKINGS	15,700	20,410	100	3	204.1	210 HOURS		\$80.48	\$31.14	\$23,440
OFFSITE DISPOSAL	31,632	41,122	78	5	527.2	530 HOURS		\$43.42	\$31.14	\$39,517
OFFSITE DUMP FEE	31,632					31,632 CY		\$4.17 PER CY		\$131,905
<b>GRADING/DOZER (D9 Dozer)</b>										
	14,500	18,850	270	1	69.81	70 HOURS		\$121.81	\$38.35	\$11,211
<b>FINAL PLACING (3 cy 375 Backhoe)</b>										
	8,100	10,530	160	1	65.81	70 HOURS		\$150.29	\$38.35	\$13,205
<b>EXCAVATE STREAM CHANNELS</b>										
	500	650	100		6.50	8 HOURS		\$19.77	\$38.35	\$465
<b>MISCELLANEOUS EXCAVATION</b>										
	1,000	1,300	100		13.00	16 HOURS		\$19.77	\$36.81	\$905
<b>TOTAL BACKFILLING &amp; GRADING</b>										<b>\$296,189</b>

**TABLE 5-20-4**

**TOPSOIL DISTRIBUTION**

	<u>BANK</u> <u>VOLUME</u>	<u>LOOSE</u> <u>VOLUME</u>	<u>PROD</u> <u>RATE</u>	<u>#</u> <u>UNITS</u>	<u>CALC</u> <u>AMOUNT</u>	<u>ESTIM</u> <u>AMOUNT</u>	<u>UNIT</u>	<u>---UNIT COST---</u> <u>EQUIP</u> <u>LABOR</u>		<u>TOTAL</u>
<b>LOADING (4.5 cy 966 Loader)</b>										
FROM STOCKPILES	8,683	9,551	300	1	31.8	36 HOURS		\$44.87	\$38.35	\$2,996
<b>HAULING (12 cy End Dumps)</b>										
TO SITE	8,683	9,551	35	9	272.9	290 HOURS		\$31.07	\$31.14	\$18,041
<b>PLACING</b>										
4.5 CY WM LOADER	5,818	6,400	185	1	34.6	36 HOURS		\$44.87	\$38.35	\$2,996
3 CY BACKHOE	2,865	3,152	160	1	19.7	20 HOURS		\$150.29	\$38.35	\$3,773
<b>GRADING/DOZING (D7 Dozer)</b>										
ON SITE	5,818	6,400	180	1	35.6	36 HOURS		\$63.51	\$38.35	\$3,667
<b>TOTAL TOPSOILING</b>										<b>\$31,473</b>

**TABLE 5-20-5**

**GENERAL PROJECT COSTS**

	ESTIMATED AMOUNT	UNIT	---UNIT COST ---		TOTAL
			EQUIP	LABOR	
<b>WATER TRUCK</b>					
BACKFILLING & GRADING	75	HOURS	\$34.63	\$24.85	\$4,461
TOPSOILING	8	HOURS	\$34.63	\$24.85	\$476
<b>PICKUP TRUCKS</b>					
BACKFILLING & GRADING	300	HOURS	\$16.17	n/a	\$4,851
TOPSOILING	36	HOURS	\$16.17	n/a	\$582
<b>LABORERS</b>					
BACKFILLING & GRADING	150	HOURS	above	\$32.20	\$4,830
TOPSOILING	18	HOURS	above	\$32.20	\$580
<b>MECHANICS</b>					
BACKFILLING & GRADING	60	HOURS	\$16.17	\$43.50	\$3,580
TOPSOILING	8	HOURS	\$16.17	\$43.50	\$477
<b>FOREMEN</b>					
BACKFILLING & GRADING	300	HOURS	\$16.17	\$45.45	\$18,486
TOPSOILING	36	HOURS	\$16.17	\$45.45	\$2,218
<b>SURVEYING</b>					
BACKFILLING & GRADING	5	DAYS	\$20.67	\$595.00	\$3,078
<b>TOPSOIL TESTING</b>					
LABOR FOR SAMPLING	18	HOURS	\$16.17	\$76.25	\$1,664
LAB ANALYSIS	18	EACH	\$310.00	n/a	\$5,580
<b>DRAINAGE CONTROL</b>					
FILTER MATERIAL	3000	LIN FT	\$1.04	incl	\$3,120
RIP-RAP	2100	TON	\$29.50	incl	\$61,950
					<b>\$115,933</b>
<b>TOTALS</b>					

**TABLE 5-20-6**

**REVEGETATION COSTS**

<u>ITEM</u>	<u>TYPE</u>	<u>AREA</u>	<u>RATE</u>	<u>UNIT</u>	<u>AMOUNT</u>	<u>UNITS</u>	<u>---UNIT COST---</u>		<u>TOTAL</u>	
							<u>EQUIP</u>	<u>LABOR</u>		
<b>1 HYDROSEEDER</b>		8.73	1.25	AC/DAY	6.984	DAY	\$587.00	INCLD	\$4,100	
<b>2 MULCH</b>		8.73	1	TON/AC	8.73	TONS	\$425.00	INCLD	\$3,710	
<b>3 FERTILIZER</b>		8.73	200	LB/AC	1746	LBS	\$0.23	INCLD	\$395	
<b>4 TACKIFIER</b>		8.73	125	LB/AC	1091.3	LBS	\$2.40	INCLD	\$2,619	
<b>5 SEED MIX (Table 4)</b>		8.73			8.73	AC	\$145.00	INCLD	\$1,266	
<b>6 SEEDLINGS (Table 4A)</b>		8.73	610	EA /AC	5325.3	EACH	\$0.58	\$1.18	\$9,373	
<b>TOTAL</b>									\$21,462	
									<b>CONTRACTOR OVERHEAD &amp; PROFIT @ 10%</b>	\$2,146
									<b>GRAND TOTAL</b>	<b>\$23,608</b>

**TABLE 5-20-7**

**10 YEAR MONITORING COST ESTIMATE**

<u>ITEM</u>	<u>BASIS</u>	<u>AMOUNT</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
<b>1 WATER MONITORING</b>					
SAMPLING	TWICE A YEAR	40	DAYS	\$210.00	\$8,400
PICKUP TRUCK	TWICE A YEAR	40	DAYS	\$130.00	\$5,200
ANALYSIS	TWICE A YEAR	10	YEAR	\$2,750.00	\$27,500
<b>2 REVEGETATION MONITORING</b>					
FIELD WORK	3 TIMES IN 10 YEARS	15	DAYS	\$630.00	\$9,450
REPORT	3 TIMES IN 10 YEARS	15	DAYS	\$210.00	\$3,150
<b>3 POND INSPECTIONS</b>					
INSPECTOR	MONTHLY FOR 2 YEARS	24	DAYS	\$210.00	\$5,040
PICKUP TRUCK	ONCE/MONTH/YEAR	24	DAYS	\$130.00	\$3,120
<b>4 SITE INSPECTION &amp; REPAIRS</b>					
INSPECTOR	ONCE/MONTH/YEAR	120	DAYS	\$210.00	\$25,200
PICKUP TRUCK	ONCE/MONTH/YEAR	120	DAYS	\$130.00	\$15,600
GULLY REPAIR	10% AREA	0.87	ACRE	\$420.05	\$367
<b>5 REVEGETATION</b>					
	20% AREA REDONE	1.75	ACRE	\$2,704.24	\$4,722
<b>GRAND TOTAL</b>					<b>\$107,748</b>

**TABLE 5-20-8**

**EQUIPMENT COSTS**

<u>EQUIPMENT</u>	<u>MONTHLY RENTAL AMOUNT</u>	<u>MONTHLY RENTAL COST/HR</u>	<u>OPERATING COST/HR</u>	<u>REGIONAL ADJUSTMENT</u>	<u>TOTAL COST/HOUR</u>
<b>DOZER:</b>					
D-6H	\$6,440.00	\$32.20	\$17.45	0.865	\$42.95
D-7H	\$9,825.00	\$49.13	\$24.30	0.865	\$63.51
D-9N	\$14,325.00	\$71.63	\$50.00	0.865	\$105.21
D-9 W/RIPPER	\$17,175.00	\$85.88	\$54.95	0.865	\$121.81
<b>BACKHOE:</b>					
375	\$22,155.00	\$110.78	\$57.15	0.895	\$150.29
436	\$2,950.00	\$14.75	\$8.10	0.865	\$19.77
<b>HAUL TRUCK:</b>					
769C	\$9,035.00	\$45.18	\$31.40	0.898	\$68.76
12 CY END DUMP	\$3,200.00	\$16.00	\$18.60	0.898	\$31.07
SCOOP (WAGNER ST-13)	\$9,750.00	\$48.75	\$37.70	0.931	\$80.48
TRACTOR	\$3,135.00	\$15.68	\$19.80	0.898	\$31.86
SEMI-TRAILER	\$345.00	\$1.73	\$1.45	0.853	\$2.71
FULL TRAILER (PUP)	\$1,255.00	\$6.28	\$4.10	0.853	\$8.85
<b>WHEEL LOADER:</b>					
988B	\$10,365.00	\$51.83	\$38.45	0.865	\$78.09
966F	\$6,365.00	\$31.83	\$20.05	0.865	\$44.87
<b>MOTOR GRADER</b>					
14G	\$6,885.00	\$34.43	\$19.95	0.865	\$47.03
<b>WATER TRUCK</b>					
5000 GALLON	\$2,995.00	\$14.98	\$12.70	0.898	\$24.85

NOTE: COSTS BASED ON DATAQUEST'S 1997 RENTAL BLUEBOOK FOR CONSTRUCTION EQUIPMENT  
LABOR COSTS ARE NOT INCLUDED

Table 5-20--

EQUIPMENT PRODUCTION ESTIMATES -- LCY

**BULLDOZER PRODUCTION**

JOB	EQUIP'T	SIZE	PUSH DISTANCE	MAX PROD	OPER	MATERIAL	CORRECTION FACTORS	OTHER	PRODUCTION
BACKFILL:							EFF'CY		
GRADING	D-9	N/A	300	430	0.8	1.1	0.84	0.85	270
TOPSOIL:									
GRADING	D-6	N/A	150	290	0.8	1.1	0.84	0.85	182
	D-7	N/A	200	290	0.8	1.1	0.84	0.85	182

**BULLDOZER RIPPING**

JOB	EQUIP'T	SIZE	DISTANCE	SPEED	CYCLE	PASSES/HR	WIDTH	DEPTH	PRODUCTION
BACKFILL:									
RIPPING	D-9	N/A	300	308	1.22	41	4	1	2360

**BACKHOE PRODUCTION**

JOB	EQUIP'T	SIZE	LOAD TIME	MAX PROD	BUCKET	MATERIAL	CORRECTION FACTORS	EFF'CY	PRODUCTION
BACKFILL:									
PLACING	375	3 CY	0.67	270	0.9	90%	75%	75%	164
MISC REMOVAL	436	2.5 CY	0.67	225	0.9	90%	75%	75%	137

**HAUL TRUCK PRODUCTION**

JOB	EQUIP'T	SIZE	DISTANCE	SPEED	TRAVEL	LOAD	DUMP	TOTAL	EFF'CY	PRODUCTION
BACKFILL										
	769C	40 TON	1200	10	3	3	2	8	83%	200
	SCOOP	13 CY	1500	8	4	1	1	6	83%	103
	Tan. Trailers	37 CY	35000	45	18	4	2	24	83%	78
TOPSOIL:										
#1 STOCKPILE	END DUMP	12 CY	1000	15	2	3	2	7	83%	92
#2 STOCKPILE	END DUMP	12 CY	5000	12	9	3	2	14	83%	41
#3 STOCKPILE	END DUMP	12 CY	8000	10	18	3	2	23	83%	26

**LOADER PRODUCTION**

JOB	EQUIP'T	SIZE	CYCLE OR LOAD TIME	MAX PROD	BUCKET	MATERIAL	CORRECTION FACTORS	EFF'CY	PRODUCTION
BACKFILL									
TOPSOIL	988	7 CY	0.65	645	0.9	90%	83%	83%	434
LOADING	966	4.5 CY	0.6	450	0.9	90%	83%	83%	303
PLACING	988	7 CY	1.6	265	0.9	90%	83%	83%	178

NOTE: ESTIMATES FROM 25TH EDITION CATERPILLAR PERFORMANCE HANDBOOK

TABLE 5-20-10

CRANDALL CYN MINE -- RECLAMATION EARTHWORK VOLUMES  
BANK CUBIC YARDS

STATION	AREA	CUT		AREA	FILL	
		VOLUME	CUMULATIVE VOLUME		VOLUME	CUMULATIVE VOLUME
60	0	271	271	0	0	0
90	487	191	461	0	0	0
100	543	3,374	3,835	0	0	0
200	1279	4,156	7,991	0	0	0
270	1927	2,296	10,287	0	158	158
300	2205	9,365	19,652	285	2,593	2,751
400	2852	11,156	30,807	1115	8,263	11,014
500	3172	7,152	37,959	3347	6,118	17,132
555	3850	5,409	43,368	2660	3,965	21,097
600	2641	4,668	48,036	2098	4,096	25,193
660	1560	2,258	50,294	1588	2,101	27,293
700	1488	5,376	55,670	1248	3,687	30,980
800	1415	7,185	62,855	743	2,607	33,588
900	2465	9,124	71,979	665	4,796	38,384
1000	2462	930	72,909	1925	704	39,088
1010	2558	2,716	75,625	1877	2,324	41,412
1045	1633	3,616	79,241	1708	3,209	44,621
1100	1917	8,965	88,206	1443	4,441	49,062
1200	2924	1,153	89,359	955	352	49,414
1210	3304	4,022	93,381	945	1,537	50,950
1255	1522	1,609	94,990	899	1,461	52,411
1300	409	207	95,197	854	439	52,850
1315	335	566	95,763	726	747	53,598
1350	539	265	96,028	427	142	53,740
1360	894	690	96,718	342	155	53,895
1375	1589	1,728	98,446	215	100	53,994
1400	2144	1,126	99,573	0	0	53,994
1415	1910	831	100,404	0	0	53,994
1430	1083	909	101,313	0	0	53,994
1470	144	13	101,326	0	0	53,994
1475	0			0		
<b>TOTALS</b>			101,326			53,994

**EXCESS CUT = 47,332 BANK CUBIC YARDS 61,532 LOOSE CUBIC YARDS**  
**CUT MATERIAL USED IN BACKFILL = 70,192 LOOSE CUBIC YARDS**  
**CUT MATERIAL DISPOSED IN MINE = 20,410 LOOSE CUBIC YARDS**  
**CUT MATERIAL HAULED TO LANDFILL = 41,122 LOOSE CUBIC YARDS**

**TABLE 5-20-11**

**CRANDALL CYN MINE -- RECLAMATION EARTHWORK VOLUMES - LANDFILL  
BANK CUBIC YARDS**

<u>STATION</u>	<u>AREA</u>	<u>CUT</u>		<u>FILL</u>		<u>CUM'TVE VOLUME</u>
		<u>VOLUME</u>	<u>CUM'TVE VOLUME</u>	<u>AREA</u>	<u>VOLUME</u>	
60	0	139	139	0	0	0
90	250	87	226	0	0	0
100	220	870	1,096	0	0	0
200	250	870	1,967	0	0	0
300	220	759	2,726	0	0	0
400	190	704	3,430	0	0	0
500	190	630	4,059	0	0	0
600	150	685	4,744	0	0	0
700	220	870	5,615	0	0	0
800	250	870	6,485	0	0	0
900	220	759	7,244	0	0	0
1000	190	352	7,596	0	0	0
1050	190	176	7,772	0	0	0
1100	0			0		
<b>TOTALS</b>			<b>7,772</b>			<b>0</b>

**EXCESS CUT =**

**10,104 LOOSE CUBIC YARDS HAULED TO LANDFILL**



## **FILL MATERIAL DISPOSAL IN MINE WORKINGS**

FROM TABLE 5-2-8, THE VOLUME OF FILL MATERIAL TO BE DISPOSED IN THE MINE WORKINGS CLOSE TO THE PORTAL AREA IS:

**20,410 LOOSE CUBIC YARDS**

NO COMPACTION WILL BE POSSIBLE FOR THIS STORAGE VOLUME.

THE AVERAGE ENTRY IS 20 FEET WIDE. THE MAXIMUM DISPOSAL HEIGHT WILL BE 5 FEET.

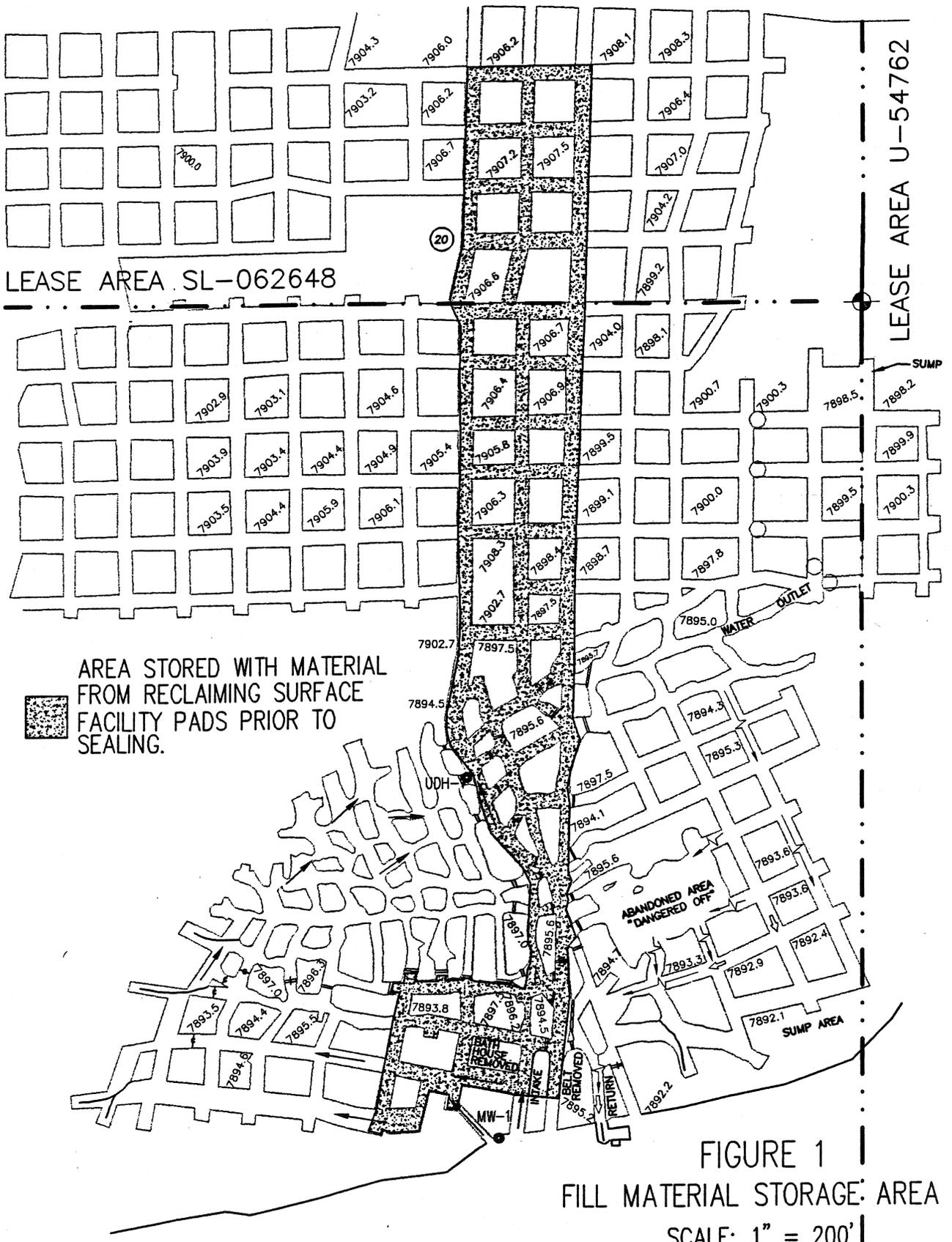
VOLUME OF LOOSE MATERIAL PER 100 FT OF LINEAR ENTRY IS:

**370 LOOSE CUBIC YARDS**

LINEAR FEET OF ENTRY TO DISPOSE THE FILL MATERIAL IS:

**5,511 FEET**

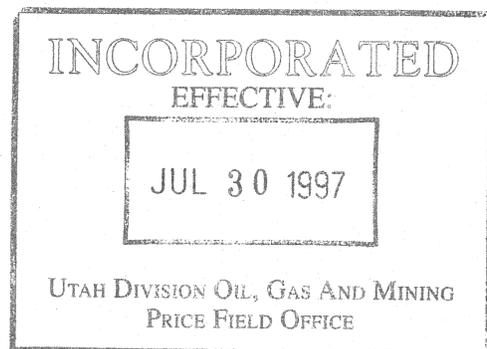
FIGURE 1 SHOWS THE AREA OF MINE WORKINGS WHERE THE FILL MATERIAL CAN BE DISPOSED. THE SHADED AREA SHOWS APPROXIMATELY 6800 FEET OF ENTRY. ADDITIONAL AREA CAN BE ADDED INBY THE SHADED AREA IF NEEDED.



**APPENDIX 5-21**

**Reclamation Fill Stability Analysis At The Crandall Canyon Mine  
Emery County, Utah**

March 12, 1997



**RECLAMATION FILL STABILITY ANALYSIS  
AT THE CRANDALL CANYON MINE  
EMERY COUNTY, UTAH**

**Prepared for**

**GENWAL RESOURCES, INC.  
195 NORTH 100 WEST  
HUNTINGTON, UTAH 84528**

**Prepared by**

**JME COMPANIES**

**Engineering, Environmental, and Geologic Services  
12211 W. Alameda Parkway, Suite 207  
Lakewood, CO 80228-2825  
303-969-9759 Fax 303763-9951**

March 12, 1997

I certify that the calculations  
contained in this report were  
prepared by me and are correct  
to the best of my knowledge



INCC  
PROFESSIONAL ENGINEER  
Richard H. Fox, P.E.  
JUL 30 1997

UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE

**RECLAMATION SOIL SLOPE STABILITY ANALYSIS  
AT THE CRANDALL CANYON MINE  
EMERY COUNTY, UTAH**

**INTRODUCTION**

This report presents the results of a slope stability investigation for potential slide areas of reclaimed soils placed on previous disturbance areas. The disturbance areas are at the Crandall Canyon portals and facilities area for Genwal Resources mine that is located in Crandall Canyon, approximately 15 miles west of Huntington, Utah.

The purpose and scope of the study were discussed with Mr. Gary Gray, Reclamation Engineer for Genwal Resources, Inc. Several slope areas were to be investigated for potential failure of the reclamation material placed over slopes disturbed by mine related activities. The investigation included review of previous stability work for the initial portal and pad excavation, road expansion, storage pad expansion, revised sediment pond, sediment pond expansion, and plan and section maps of the proposed reclamation for the area.

**PROJECT DESCRIPTION**

The project is in the south center portion of Section 5, T. 16 S., R. 7 W, Salt Lake Base and Meridian. Two portal pads, an access road to the pads, a coal stockpile pad, and a sediment pond are being reclaimed. One road will remain unreclaimed as access to US Forest Service land.

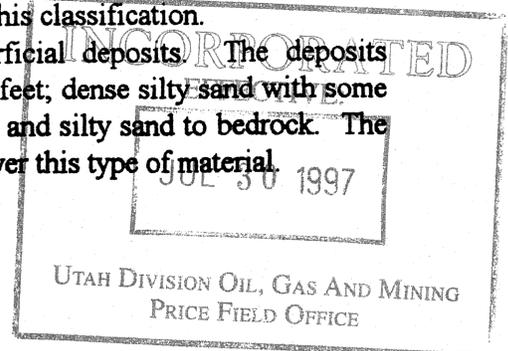
The reclamation will be done using existing borrow area materials and previously stockpiled topsoil excavated during site construction.

**SURFACE AND SUBSURFACE DESCRIPTION**

The site is located close to the bottom of a prominent ridge, just above the Crandall Creek drainage. The slopes are generally steep, varying from 30 to 40 degrees to near vertical where cliff forming sandstones are exposed. The Blackhawk formation form the upper portion of the ridge with alternating cliff forming sandstone units and slope forming materials consisting of soft to hard sand shale and several coal beds. The lower portion of the slopes is in the Star Point formation which consists of cliff forming sandstone separated by tongues of yellow to gray slope forming shale.

The reclamation soil will be placed over disturbance that is generally on subsoils that can be placed in 4 classifications:

1. Areas of exposed bedrock. This occurs on the upper access cut for the portals and portal pads.
2. Areas where bedrock is covered by 10 to 40 inches  $\pm$  of silty sand with gravel and cobbles. Parts of the upper access road cut and portal pads are in this classification. The lower access road (U.S.F.S. access road) is also in this classification.
3. Areas where bedrock is covered by 15 feet  $\pm$  of surficial deposits. The deposits generally consist of silt and fine gravel between 0 and 4 feet; dense silty sand with some gravel and cobbles between 4 and 12 feet; and boulders and silty sand to bedrock. The coal pad and sediment pond embankment were placed over this type of material.



4. Areas over fill placed for pads and embankments. These areas are on the slopes of the coal storage pad and the sediment pond embankment.

### **SLOPE STABILITY ANALYSIS**

The computer program used to evaluate the stability of the reclamation slopes involving a slip circle failure is called REAME (Rotational Equilibrium Analysis of Multilayered Embankments) that is based on a simplified Bishop method of analysis. The program was developed by Dr. Y. H. Huang, Professor of Civil Engineering, University of Kentucky.

### **SOIL PROPERTIES**

A set of conservative soil properties was selected after reviewing data from a report by Earthfax Engineering, Inc., dated November 9, 1990. Sample FS-1 is uncompacted silty gravelly sand that may have been a composite of road base and native fill material taken from the fill slope of the surface coal storage pad. Sample SS-1 is a silty gravelly sand with calcium carbonate cementation that was taken along the north bank of Crandall Creek. Both samples were subjected to unsaturated and undrained direct shear tests to determine soil strength factors. Both of the samples were nonplastic and were in the the Unified Soil Class SM. The soil samples drained well and, although there was approximately 20 percent passing a #200 sieve, the material contained silt and not clay. The material from FS-1 and SS-1 represent the type of natural material that will be used for reclamation fill.

### **SOIL MATERIAL PROPERTIES**

<b>SAMPLE</b>	<b>DENSITY (pcf)</b>	<b>INTERNAL FRICTION (Degrees)</b>	<b>COHESION (psf)</b>
FS-1	123.5	55	1600
SS-1	110	46	700
Stability Study	135	40	200

The 135 pcf used for density is for a saturated soil. The internal friction angle and cohesion were reduced to represent fill material that is not as highly compacted as an engineered fill such as the sediment pond embankment or the coal storage pad.

A 20 percent pore pressure ratio was used to account for potential saturation and concentration of water at the reclamation soil-bedrock contact. This type of condition would cause seeps at the toe of the reclamation soil slope.

**CRITICAL SLIP CIRCLES AND FACTORS OF SAFETY**

<b>SECTION</b>	<b>STABILITY METHOD</b>	<b>HORIZONTAL DISTANCE</b>	<b>ELEVATION</b>	<b>CRITICAL RADIUS</b>	<b>FACTOR OF SAFETY</b>
6 North	Static	481.57	8043.79	103.02	1.64
9 North	Static	480.15	7929.55	45.69	2.21
9 South	Static	252.55	7873.85	73.73	2.44
10 North	Static	406.3	7922.5	109.11	1.57
11 North	Static	385.85	7957.75	148.33	1.40

The static stability for all sections were above the minimum 1.3 static factor of safety . required by D.O.G.M. to meet reclamation standards in the MRP for the Crandall Canyon Mine

The data input, output of first and last stability circles and location of critical stability circle for each run are attached. Reduced plan and section maps showing the location of the sections and the critical circle for the sections reviewed are included.

**SLOPE STABILITY - SECTION 6 - STATIC  
NORTH SIDE OF CRANDALL CREEK**

ROTATIONAL EQUILIBRIUM ANALYSIS OF MULTILAYERED EMBANKMENTS  
VERSION 1.21 LAST MODIFIED ON JAN-10-91

TODAY'S DATE = 03-05-1997 RUN TIME = 22:06:07

TITLE =GENWAL CRANDALL CANYON RECLAMATION SLOPE FOR SECTION 6+00 STATIC

FILE NAME =\basic\qb\reame\gen-6-1.SLP

READING FROM FILE

NO. OF STATIC AND SEISMIC CASES = 1

CASE NO. 1 SEISMIC COEFFICIENT = 0

NO. OF BOUNDARY LINES = 2

NO. OF POINTS ON BOUNDARY LINE 1 = 13

BOUNDARY LINE - 1

POINT	X-COORD	Y-COORD
1	287.00	7850.00
2	344.00	7850.00
3	359.00	7860.00
4	384.00	7870.00
5	405.00	7870.00
6	418.00	7880.00
7	428.00	7900.00
8	500.00	7942.00
9	531.00	7950.00
10	550.00	7960.00
11	563.00	7970.00
12	564.00	7982.00
13	571.00	7987.00

NO. OF POINTS ON BOUNDARY LINE 2 = 6

BOUNDARY LINE - 2

POINT	X-COORD	Y-COORD
1	287.00	7850.00
2	332.00	7860.00
3	387.00	7880.00
4	428.00	7900.00
5	500.00	7942.00
6	571.00	7987.00

LINE NO. AND SLOPE OF EACH SEGMENT ARE:

1	0	.6666667	.4	0	.7692308	2	.5833333	.2580645	.5263158	.7692308	12	.7142857
2		.2222222	.3636364	.4878049	.5833333	.6338028						

MIN. DEPTH OF TALLEST SLICE = 2

NO. OF RADIUS CONTROL ZONES = 1

RADIUS DECREMENT FOR ZONE 1 = 0  
NO. OF CIRCLES FOR ZONE 1 = 5  
ID NO. OF FIRST CIRCLE FOR ZONE 1 = 1  
NO. OF BOTTOM LINES FOR ZONE 1 = 1

FOR ZONE 1      LINE SEQUENCE 1  
LINE NO.=1      BEG. NO.=1    END NO.=13

SOIL NO.	COHESION	FRIC. ANGLE	UNIT WEIGHT
1	200	40	135

USE PORE PRESSURE RATIO  
USE GRID  
NO. OF SLICES= 6    NO. OF ADD. RADII= 3

PORE PRESSURE RATIO= .2  
COORDINATES OF GRID POINTS 1, 2, AND 3

POINT 1 X-COORD. = 170	Y-COORD. = 8050
POINT 2 X-COORD. = 272	Y-COORD. = 7848
POINT 3 X-COORD. = 580	Y-COORD. = 8000

X INCREMENT = 5    Y INCREMENT = 5  
NO. OF DIVISIONS BETWEEN POINTS 1 AND 2= 36  
NO. OF DIVISIONS BETWEEN POINTS 2 AND 3= 25

AT POINT ( 170 8050 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
231.7089      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 231.7089

AT POINT ( 172.8333 8044.389 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
225.4351      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 225.4351

### DATA REMOVED FOR REPORT SUMMARY

AT POINT ( 482.817 8042.541 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
101.2713      1.641088  
99.84099      1.767204  
98.41063      1.988624  
96.98027      2.448517  
95.54991      1000000  
LOWEST FACTOR OF SAFETY = 1.641088 AND OCCURS AT RADIUS = 101.2713

AT POINT ( 480.317 8042.541 ) THE RADIUS AND FACTOR OF SAFETY ARE:

102.2699	1.664145
100.9075	1.798382
99.54509	2.032656
98.18269	2.517398
96.82028	1000000

LOWEST FACTOR OF SAFETY = 1.664145 AND OCCURS AT RADIUS = 102.2699

AT POINT ( 481.567 8043.791 ) THE RADIUS AND FACTOR OF SAFETY ARE:

103.021	1.637418
101.5857	1.763284
100.1504	1.984129
98.71509	2.442613
97.27979	1000000

LOWEST FACTOR OF SAFETY = 1.637418 AND OCCURS AT RADIUS = 103.021

AT POINT ( 481.567 8045.041 ) THE RADIUS AND FACTOR OF SAFETY ARE:

103.7755	1.657748
102.4005	1.79066
101.0254	2.022748
99.6504	2.502934
98.27535	1000000

LOWEST FACTOR OF SAFETY = 1.657748 AND OCCURS AT RADIUS = 103.7755

AT POINT ( 482.817 8043.791 ) THE RADIUS AND FACTOR OF SAFETY ARE:

102.0235	1.661688
100.6539	1.795024
99.28426	2.027869
97.91463	2.509894
96.54499	1000000

LOWEST FACTOR OF SAFETY = 1.661688 AND OCCURS AT RADIUS = 102.0235

AT POINT ( 480.317 8043.791 ) THE RADIUS AND FACTOR OF SAFETY ARE:

103.4802	1.651432
102.0869	1.782166
100.6936	2.010725
99.30031	2.484257
97.907	1000000

LOWEST FACTOR OF SAFETY = 1.651432 AND OCCURS AT RADIUS = 103.4802

AT POINT ( 481.567 8043.791 ) RADIUS 103.021

THE MINIMUM FACTOR OF SAFETY IS 1.637418

**SLOPE STABILITY - SECTION 9 - STATIC  
NORTH SIDE OF CRANDALL CREEK**

ROTATIONAL EQUILIBRIUM ANALYSIS OF MULTILAYERED EMBANKMENTS  
VERSION 1.21 LAST MODIFIED ON JAN-10-91

TODAY'S DATE = 03-06-1997 RUN TIME = 21:57:24

TITLE =GENWAL CRANDALL CANYON RECLAMATION STABILITY FOR SECTION 9+00  
STATIC

FILE NAME =\basic\qb\reame\gen-9nor.SLP

READING FROM FILE

NO. OF STATIC AND SEISMIC CASES = 1

CASE NO. 1 SEISMIC COEFFICIENT = 0

NO. OF BOUNDARY LINES = 2

NO. OF POINTS ON BOUNDARY LINE 1 = 10

BOUNDARY LINE - 1

POINT	X-COORD	Y-COORD
1	393.00	7827.00
2	414.00	7830.00
3	426.00	7840.00
4	444.00	7857.00
5	470.00	7880.00
6	478.00	7882.00
7	491.00	7885.00
8	507.00	7885.00
9	515.00	7900.00
10	521.00	7906.00

NO. OF POINTS ON BOUNDARY LINE 2 = 6

BOUNDARY LINE - 2

POINT	X-COORD	Y-COORD
1	393.00	7827.00
2	426.00	7840.00
3	444.00	7857.00
4	470.00	7880.00
5	478.00	7882.00
6	521.00	7906.00

LINE NO. AND SLOPE OF EACH SEGMENT ARE:

1	.1428571	.8333333	.9444444	.8846154	.25	.2307692	0	1.875	1
2	.3939394	.9444444	.8846154	.25	.5581396				

MIN. DEPTH OF TALLEST SLICE = .5

NO. OF RADIUS CONTROL ZONES = 1

RADIUS DECREMENT FOR ZONE 1 = 0

NO. OF CIRCLES FOR ZONE 1 = 5  
ID NO. OF FIRST CIRCLE FOR ZONE 1 = 1  
NO. OF BOTTOM LINES FOR ZONE 1 = 1

FOR ZONE 1      LINE SEQUENCE 1  
LINE NO.=1      BEG. NO.=1    END NO.= 10

SOIL NO.	COHESION	FRIC. ANGLE	UNIT WEIGHT
1	200	40	135

USE PORE PRESSURE RATIO  
USE GRID  
NO. OF SLICES= 10    NO. OF ADD. RADII= 3

PORE PRESSURE RATIO= .2  
COORDINATES OF GRID POINTS 1, 2, AND 3

POINT 1 X-COORD. = 260	Y-COORD. = 7983
POINT 2 X-COORD. = 368	Y-COORD. = 7817
POINT 3 X-COORD. = 530	Y-COORD. = 7925

X INCREMENT = 5    Y INCREMENT = 5  
NO. OF DIVISIONS BETWEEN POINTS 1 AND 2= 20  
NO. OF DIVISIONS BETWEEN POINTS 2 AND 3= 20

AT POINT ( 260 7983 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
205 1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 205

AT POINT ( 265.4 7974.7 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
195.1848      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 195.1848

AT POINT ( 270.8 7966.4 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
185.3788      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 185.3788

### DATA REMOVED FOR REPORT SUMMARY

AT POINT ( 486.4 7928.302 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
40.23618      2.488947  
39.45625      2.755804  
38.67633      3.21643  
37.89641      4.162469  
37.11649      7.047863  
LOWEST FACTOR OF SAFETY = 2.488947 AND OCCURS AT RADIUS = 40.23618

AT POINT ( 478.9 7928.302 ) THE RADIUS AND FACTOR OF SAFETY ARE:

44.91358	2.256868
43.92922	2.459867
42.94487	2.816206
41.96051	3.556435
40.97615	5.834179

LOWEST FACTOR OF SAFETY = 2.256868 AND OCCURS AT RADIUS = 44.91358

AT POINT ( 480.15 7929.552 ) THE RADIUS AND FACTOR OF SAFETY ARE:

45.69277	2.210005
44.64904	2.39872
43.6053	2.731908
42.56157	3.427411
41.51783	5.574027

LOWEST FACTOR OF SAFETY = 2.210005 AND OCCURS AT RADIUS = 45.69277

AT POINT ( 480.15 7930.802 ) THE RADIUS AND FACTOR OF SAFETY ARE:

46.51098	2.245097
45.5219	2.447822
44.53282	2.803027
43.54374	3.541034
42.55466	5.808965

LOWEST FACTOR OF SAFETY = 2.245097 AND OCCURS AT RADIUS = 46.51098

AT POINT ( 481.4 7929.552 ) THE RADIUS AND FACTOR OF SAFETY ARE:

44.7467	2.264048
43.77033	2.469091
42.79397	2.828791
41.8176	3.575498
40.84124	5.872989

LOWEST FACTOR OF SAFETY = 2.264048 AND OCCURS AT RADIUS = 44.7467

AT POINT ( 478.9 7929.552 ) THE RADIUS AND FACTOR OF SAFETY ARE:

46.13157	2.231561
45.12191	2.42886
44.11226	2.775535
43.1026	3.496699
42.09295	5.716574

LOWEST FACTOR OF SAFETY = 2.231561 AND OCCURS AT RADIUS = 46.13157

AT POINT ( 480.15 7929.552 ) RADIUS 45.69277

THE MINIMUM FACTOR OF SAFETY IS 2.210005

**SLOPE STABILITY - SECTION 9 - STATIC  
SOUTH SIDE OF CRANDALL CREEK**

ROTATIONAL EQUILIBRIUM ANALYSIS OF MULTILAYERED EMBANKMENTS  
VERSION 1.21 LAST MODIFIED ON JAN-10-91

TODAY'S DATE = 03-05-1997 RUN TIME = 22:31:19

TITLE =GENWAL CRANDALL CANYON RECLAMATION STABILITY FOR SECTION 9+00  
STATIC

FILE NAME =\BASIC\QB\REAME\GEN-9SOU.SLP

READING FROM FILE

NO. OF STATIC AND SEISMIC CASES = 1

CASE NO. 1 SEISMIC COEFFICIENT = 0

NO. OF BOUNDARY LINES = 2

NO. OF POINTS ON BOUNDARY LINE 1 = 3

BOUNDARY LINE - 1  
POINT X-COORD Y-COORD  
1 190.00 7830.00  
2 226.00 7800.00  
3 262.00 7800.00

NO. OF POINTS ON BOUNDARY LINE 2 = 2

BOUNDARY LINE - 2  
POINT X-COORD Y-COORD  
1 190.00 7830.00  
2 262.00 7800.00

LINE NO. AND SLOPE OF EACH SEGMENT ARE:

1 -.8333333 0  
2 -.4166667

MIN. DEPTH OF TALLEST SLICE = .5  
NO. OF RADIUS CONTROL ZONES = 1

RADIUS DECREMENT FOR ZONE 1 = 0  
NO. OF CIRCLES FOR ZONE 1 = 5  
ID NO. OF FIRST CIRCLE FOR ZONE 1 = 1  
NO. OF BOTTOM LINES FOR ZONE 1 = 1

FOR ZONE 1 LINE SEQUENCE 1  
LINE NO.=1 BEG. NO.=1 END NO.=3

SOIL NO.	COHESION	FRIC. ANGLE	UNIT WEIGHT
1	200	40	135

USE PORE PRESSURE RATIO

USE GRID  
NO. OF SLICES= 10 NO. OF ADD. RADII= 3

PORE PRESSURE RATIO= .2  
COORDINATES OF GRID POINTS 1, 2, AND 3

POINT 1 X-COORD. = 245      Y-COORD. = 7977  
POINT 2 X-COORD. = 183      Y-COORD. = 7843  
POINT 3 X-COORD. = 275      Y-COORD. = 7800

X INCREMENT = 5    Y INCREMENT = 5  
NO. OF DIVISIONS BETWEEN POINTS 1 AND 2= 20  
NO. OF DIVISIONS BETWEEN POINTS 2 AND 3= 20

AT POINT ( 245 7977 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
156.9522      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 156.9522

AT POINT ( 241.9 7970.3 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
149.5916      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 149.5916

AT POINT ( 238.8 7963.6 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
142.2332      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 142.2332

### DATA REMOVED FOR SUMMARY REPORT

AT POINT ( 251.3 7875.099 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
73.8889      2.458972  
72.15244      2.5884  
70.41597      2.82747  
68.6795      3.34189  
66.94304      4.959418  
LOWEST FACTOR OF SAFETY = 2.458972 AND OCCURS AT RADIUS = 73.8889

AT POINT ( 252.55 7876.349 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
75.64941      2.446155  
73.88776      2.573485  
72.12612      2.808969  
70.36448      3.315836  
68.60284      4.910172  
LOWEST FACTOR OF SAFETY = 2.446155 AND OCCURS AT RADIUS = 75.64941

AT POINT ( 252.55 7873.849 ) THE RADIUS AND FACTOR OF SAFETY ARE:

73.72885	2.435149
71.88978	2.553092
70.0507	2.774391
68.21163	3.255505
66.37256	4.778462

LOWEST FACTOR OF SAFETY = 2.435149 AND OCCURS AT RADIUS = 73.72885

AT POINT ( 252.55 7872.599 ) THE RADIUS AND FACTOR OF SAFETY ARE:

72.59863	2.438661
70.75484	2.55547
68.91104	2.775415
67.06725	3.254317
65.22345	4.772328

LOWEST FACTOR OF SAFETY = 2.438661 AND OCCURS AT RADIUS = 72.59863

AT POINT ( 253.8 7873.849 ) THE RADIUS AND FACTOR OF SAFETY ARE:

73.84863	2.451451
72.08176	2.577386
70.31488	2.810982
68.548	3.315103
66.78113	4.903771

LOWEST FACTOR OF SAFETY = 2.451451 AND OCCURS AT RADIUS = 73.84863

AT POINT ( 251.3 7873.849 ) THE RADIUS AND FACTOR OF SAFETY ARE:

72.92862	2.452916
71.15344	2.577445
69.37827	2.809133
67.60309	3.30995
65.82791	4.890348

LOWEST FACTOR OF SAFETY = 2.452916 AND OCCURS AT RADIUS = 72.92862

AT POINT ( 252.55 7873.849 ) RADIUS 73.72885

THE MINIMUM FACTOR OF SAFETY IS 2.435149

**SLOPE STABILITY - SECTION 10 - STATIC  
NORTH SIDE OF CRANDALL CREEK**

ROTATIONAL EQUILIBRIUM ANALYSIS OF MULTILAYERED EMBANKMENTS  
VERSION 1.21 LAST MODIFIED ON JAN-10-91

TODAY'S DATE = 03-05-1997 RUN TIME = 22:13:10

TITLE =GENWAL CRANDALL CANYON RECLAMATION STABILITY FOR SECTION 10+00  
STATIC

FILE NAME =\BASIC\QB\REAME\GEN-10-1.SLP

READING FROM FILE

NO. OF STATIC AND SEISMIC CASES = 1

CASE NO. 1 SEISMIC COEFFICIENT = 0

NO. OF BOUNDARY LINES = 2

NO. OF POINTS ON BOUNDARY LINE 1 = 11

BOUNDARY LINE - 1

POINT	X-COORD	Y-COORD
1	402.00	7812.00
2	466.00	7820.00
3	477.00	7830.00
4	480.00	7840.00
5	492.00	7850.00
6	498.00	7860.00
7	502.00	7870.00
8	511.00	7880.00
9	528.00	7890.00
10	567.00	7890.00
11	573.00	7910.00

NO. OF POINTS ON BOUNDARY LINE 2 = 5

BOUNDARY LINE - 2

POINT	X-COORD	Y-COORD
1	402.00	7812.00
2	502.00	7870.00
3	511.00	7880.00
4	528.00	7890.00
5	573.00	7910.00

LINE NO. AND SLOPE OF EACH SEGMENT ARE:

1	.125	.9090909	3.333333	.8333333	1.666667	2.5	1.111111	.5882353	0	3.333333
2	.58	1.111111	.5882353	.4444444						

MIN. DEPTH OF TALLEST SLICE = .5

NO. OF RADIUS CONTROL ZONES = 1

RADIUS DECREMENT FOR ZONE 1 = 0  
NO. OF CIRCLES FOR ZONE 1 = 5  
ID NO. OF FIRST CIRCLE FOR ZONE 1 = 1  
NO. OF BOTTOM LINES FOR ZONE 1 = 1

FOR ZONE 1      LINE SEQUENCE 1  
LINE NO.=1      BEG. NO.=1    END NO.=11

SOIL NO.	COHESION	FRIC. ANGLE	UNIT WEIGHT
1	200	40	135

USE PORE PRESSURE RATIO  
USE GRID  
NO. OF SLICES= 10    NO. OF ADD. RADII= 3

PORE PRESSURE RATIO= .2  
COORDINATES OF GRID POINTS 1, 2, AND 3

POINT 1 X-COORD. = 190	Y-COORD. = 8150
POINT 2 X-COORD. = 375	Y-COORD. = 7810
POINT 3 X-COORD. = 588	Y-COORD. = 7930

X INCREMENT = 5    Y INCREMENT = 5  
NO. OF DIVISIONS BETWEEN POINTS 1 AND 2= 20  
NO. OF DIVISIONS BETWEEN POINTS 2 AND 3= 20

AT POINT ( 190 8150 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
398.9837      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 398.9837

AT POINT ( 199.25 8133 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
379.669      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 379.669

AT POINT ( 208.5 8116 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
360.3585      1000000  
LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 360.3585

### DATA REMOVED FOR SUMMARY REPORT

AT POINT ( 406.3 7922.5 ) THE RADIUS AND FACTOR OF SAFETY ARE:  
109.1134      1.568819  
105.9764      1.602489  
102.8395      1.681782

99.70258      1.877028  
96.56566      2.53976

LOWEST FACTOR OF SAFETY = 1.568819 AND OCCURS AT RADIUS = 109.1134

AT POINT ( 406.3 7923.75 ) THE RADIUS AND FACTOR OF SAFETY ARE:

109.7614      1.569471  
106.7111      1.60635  
103.6608      1.690252  
100.6105      1.893496  
97.56027      2.577722

LOWEST FACTOR OF SAFETY = 1.569471 AND OCCURS AT RADIUS = 109.7614

AT POINT ( 407.55 7922.5 ) THE RADIUS AND FACTOR OF SAFETY ARE:

108.0604      1.573135  
105.0087      1.609432  
101.9569      1.692682  
98.90513      1.895195  
95.85336      2.578268

LOWEST FACTOR OF SAFETY = 1.573135 AND OCCURS AT RADIUS = 108.0604

AT POINT ( 405.05 7922.5 ) THE RADIUS AND FACTOR OF SAFETY ARE:

109.2684      1.570748  
106.2259      1.607752  
103.1834      1.691897  
100.1409      1.895677  
97.09839      2.581679

LOWEST FACTOR OF SAFETY = 1.570748 AND OCCURS AT RADIUS = 109.2684

AT POINT ( 406.3 7922.5 ) RADIUS 109.1134

THE MINIMUM FACTOR OF SAFETY IS 1.568819

**SLOPE STABILITY - SECTION 11 - STATIC  
NORTH SIDE OF CRANDALL CREEK**

ROTATIONAL EQUILIBRIUM ANALYSIS OF MULTILAYERED EMBANKMENTS  
VERSION 1.21 LAST MODIFIED ON JAN-10-91

TODAY'S DATE = 03-05-1997 RUN TIME = 22:18:37

TITLE =GENWAL CRANDALL CANYON RECLAMATION STABILITY FOR SECTION 11+00  
STATIC

FILE NAME =\BASIC\QB\REAME\GEN-11-1.SLP

READING FROM FILE

NO. OF STATIC AND SEISMIC CASES = 1

CASE NO. 1 SEISMIC COEFFICIENT = 0

NO. OF BOUNDARY LINES = 2

NO. OF POINTS ON BOUNDARY LINE 1 = 7

BOUNDARY LINE - 1

POINT	X-COORD	Y-COORD
1	419.00	7813.00
2	450.00	7820.00
3	467.00	7830.00
4	519.00	7880.00
5	562.00	7890.00
6	568.00	7900.00
7	580.00	7918.00

NO. OF POINTS ON BOUNDARY LINE 2 = 3

BOUNDARY LINE - 2

POINT	X-COORD	Y-COORD
1	419.00	7813.00
2	519.00	7880.00
3	580.00	7918.00

LINE NO. AND SLOPE OF EACH SEGMENT ARE:

1	.2258064	.5882353	.9615384	.2325581	1.666667	1.5
2	.67	.6229508				

MIN. DEPTH OF TALLEST SLICE = .5  
NO. OF RADIUS CONTROL ZONES = 1

RADIUS DECREMENT FOR ZONE 1 = 0

NO. OF CIRCLES FOR ZONE 1 = 5

ID NO. OF FIRST CIRCLE FOR ZONE 1 = 1

NO. OF BOTTOM LINES FOR ZONE 1 = 1

FOR ZONE 1 LINE SEQUENCE 1  
LINE NO.=1 BEG. NO.=1 END NO.=7

---

SOIL NO.	COHESION	FRIC. ANGLE	UNIT WEIGHT
1	200	40	135

USE PORE PRESSURE RATIO

USE GRID

NO. OF SLICES= 10 NO. OF ADD. RADII= 3

PORE PRESSURE RATIO= .2

COORDINATES OF GRID POINTS 1, 2, AND 3

POINT 1 X-COORD. = 282 Y-COORD. = 8000

POINT 2 X-COORD. = 400 Y-COORD. = 7813

POINT 3 X-COORD. = 590 Y-COORD. = 7936

X INCREMENT = 5 Y INCREMENT = 5

NO. OF DIVISIONS BETWEEN POINTS 1 AND 2= 20

NO. OF DIVISIONS BETWEEN POINTS 2 AND 3= 20

AT POINT ( 282 8000 ) THE RADIUS AND FACTOR OF SAFETY ARE:

231.8146 1000000

LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 231.8146

AT POINT ( 287.9 7990.65 ) THE RADIUS AND FACTOR OF SAFETY ARE:

220.7865 1000000

LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 220.7865

AT POINT ( 293.8 7981.3 ) THE RADIUS AND FACTOR OF SAFETY ARE:

209.7615 1000000

LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 209.7615

AT POINT ( 299.7 7971.95 ) THE RADIUS AND FACTOR OF SAFETY ARE:

198.7398 1000000

LOWEST FACTOR OF SAFETY = 1000000 AND OCCURS AT RADIUS = 198.7398

### DATA REMOVED FOR SUMMARY REPORT

AT POINT ( 382.0999 7957.749 ) THE RADIUS AND FACTOR OF SAFETY ARE:

149.3779 1.441406

147.6607 1.543221

145.9435 1.722038

144.2263 2.093626

142.509 3.236786

LOWEST FACTOR OF SAFETY = 1.441406 AND OCCURS AT RADIUS = 149.3779

---

AT POINT ( 388.3499 7957.749 ) THE RADIUS AND FACTOR OF SAFETY ARE:

146.5985	1.414483
144.7414	1.506162
142.8843	1.668985
141.0272	2.010027
139.1701	3.064745

LOWEST FACTOR OF SAFETY = 1.414483 AND OCCURS AT RADIUS = 146.5985

AT POINT ( 385.8499 7957.749 ) THE RADIUS AND FACTOR OF SAFETY ARE:

148.3313	1.401142
146.4059	1.488633
144.4806	1.644723
142.5553	1.972763
140.6299	2.988877

LOWEST FACTOR OF SAFETY = 1.401142 AND OCCURS AT RADIUS = 148.3313

AT POINT ( 384.5999 7957.749 ) THE RADIUS AND FACTOR OF SAFETY ARE:

148.78	1.40953
146.9041	1.5002
145.0282	1.661315
143.1522	1.998844
141.2763	3.042746

LOWEST FACTOR OF SAFETY = 1.40953 AND OCCURS AT RADIUS = 148.78

AT POINT ( 385.8499 7958.999 ) THE RADIUS AND FACTOR OF SAFETY ARE:

149.2323	1.405294
147.3345	1.494601
145.4366	1.653584
143.5387	1.986839
141.6409	3.018396

LOWEST FACTOR OF SAFETY = 1.405294 AND OCCURS AT RADIUS = 149.2323

AT POINT ( 385.8499 7956.499 ) THE RADIUS AND FACTOR OF SAFETY ARE:

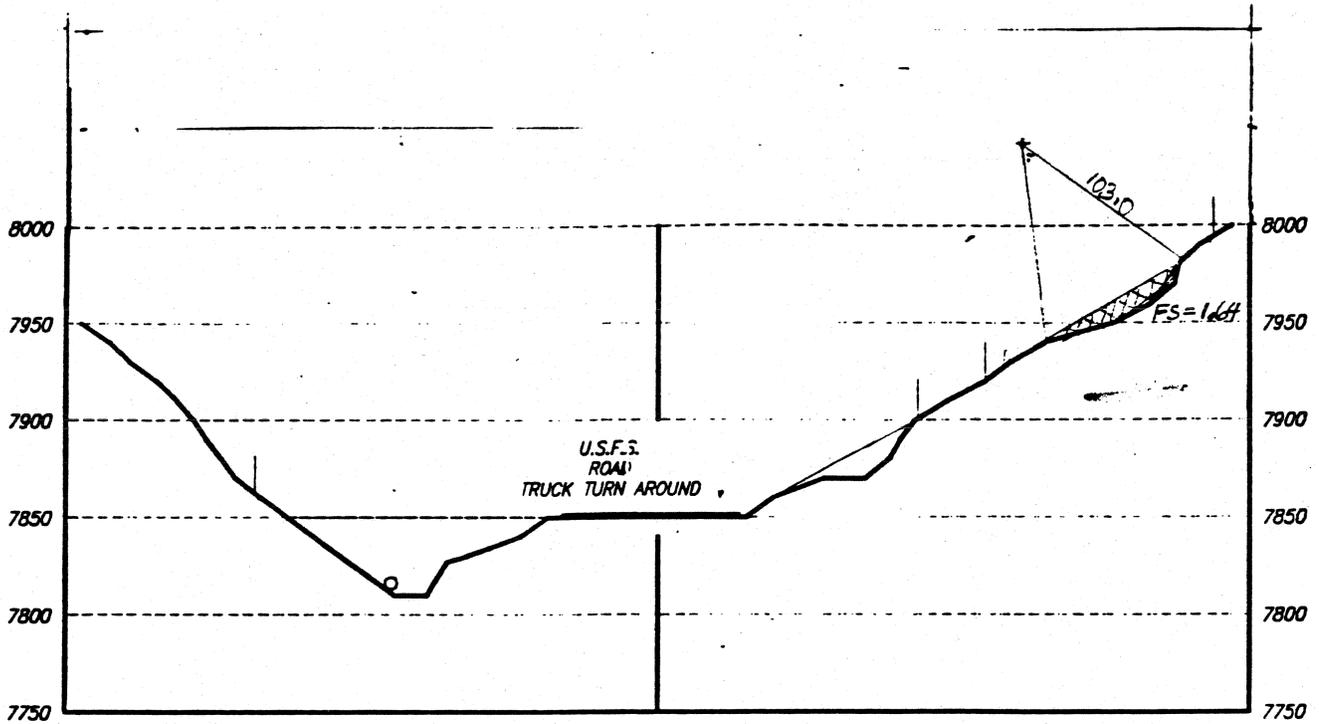
147.2778	1.402374
145.3555	1.489947
143.4331	1.646249
141.5108	1.974739
139.5884	2.992398

LOWEST FACTOR OF SAFETY = 1.402374 AND OCCURS AT RADIUS = 147.2778

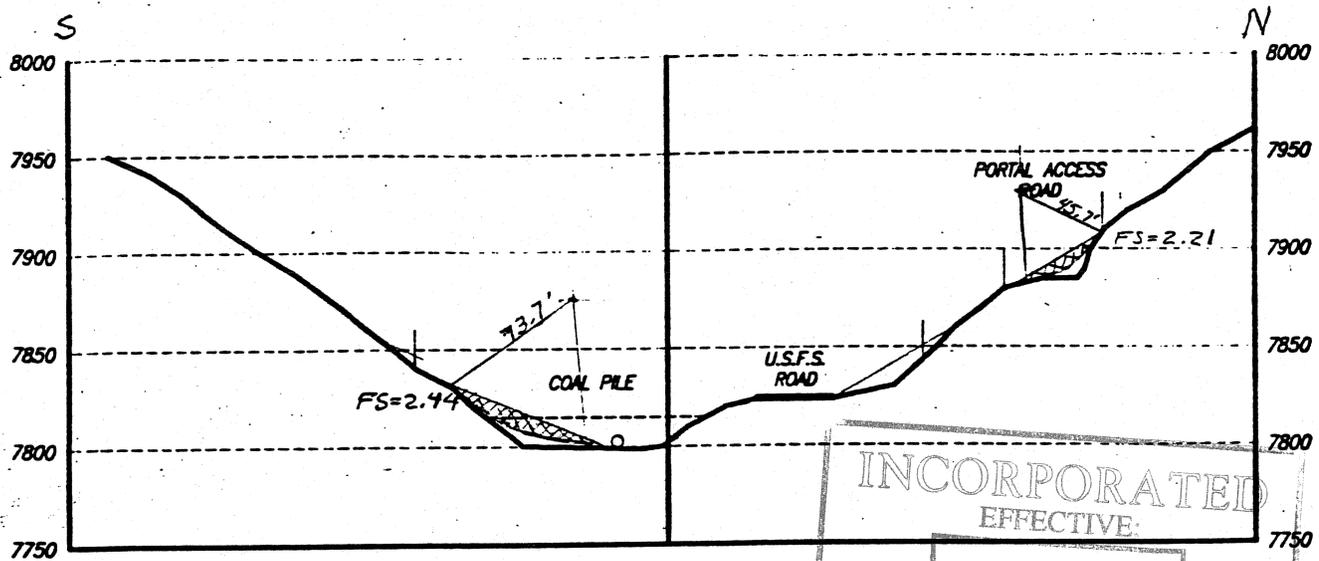
AT POINT ( 385.8499 7957.749 ) RADIUS 148.3313

THE MINIMUM FACTOR OF SAFETY IS 1.401142

# CRANDALL CANYON MINE RECLAMATION STABILITY SECTIONS



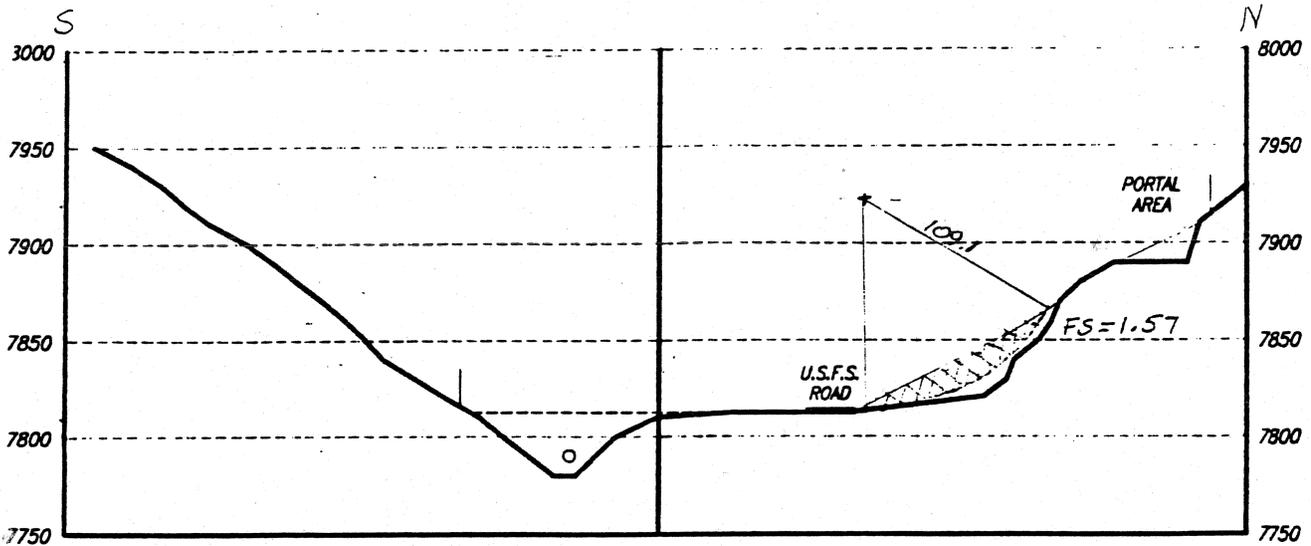
6+00



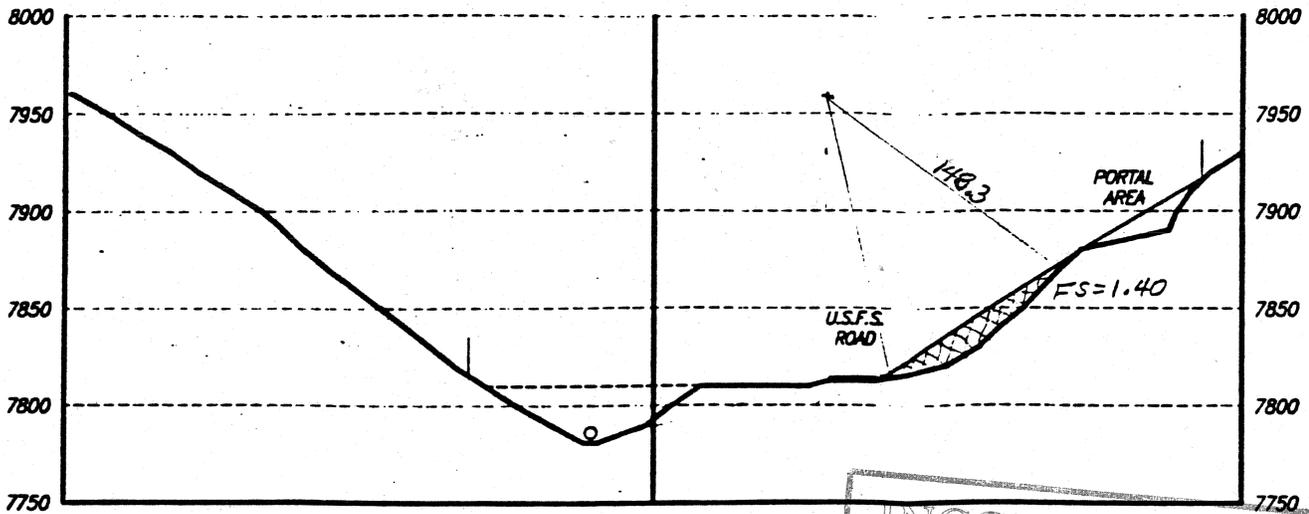
9+00

INCORPORATED  
EFFECTIVE:  
JUL 30 1997  
UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE

# CRANDALL CANYON MINE RECLAMATION STABILITY SECTIONS

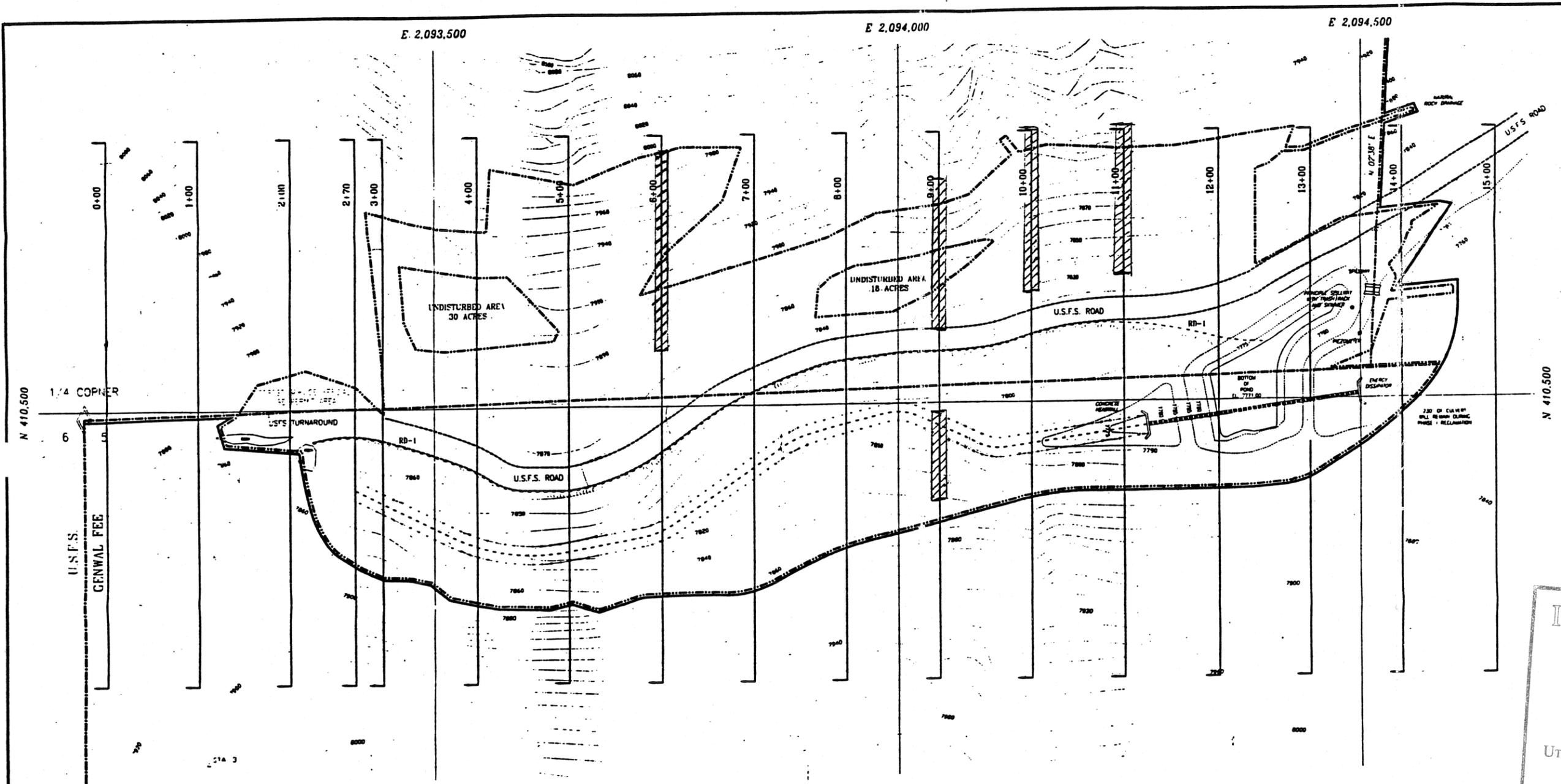


10+00



11+00

INCORPORATED  
EFFECTIVE:  
JUL 30 1997  
UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE



**LEGEND:**

- DISTURBED AREA
- PERMIT AREA
- 10' CONTOUR
- CROSS-SECTION
- RECLAMATION DIVERSION DITCH
- BERM
- ALTERNATE SEDIMENT CONTROL
- 6" Ø CULVERT



25' 0' 50' 100'

CONTOUR INTERVAL = 10'

PHOTOGRAPHY DATE = OCTOBER 25, 1989

Slope Area Analyzed for Reclamation Material Failure



I hereby certify that the design and/or map contained herein was prepared by me or under my supervision and is true and correct to the best of my knowledge.

**NOTE:**

- 1) SEDIMENT POND WILL STAY IN PLACE DURING PHASE I RECLAMATION.
- 2) STREAM BED WILL BE RETURNED AS IT PRESENTLY EXISTS.

**<REVISIONS>**

01/15/96	D.B.
12/11/96	D.B.

**GENWAL**  
RESOURCES, INC.

P.O. Box 1420 185 North 100 West Huntington, Utah  
Telephone (801) 687-1813

**CRANDALL CANYON MINE  
RECLAMATION (PHASE I)**

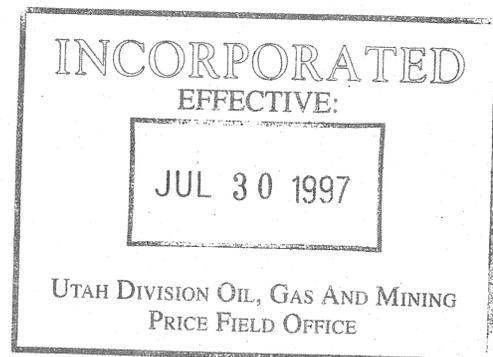
DRAWN BY: WOLF DRAFTING	ACAD REF: PHASE I
DATE: 01/01/96	PLATE #: 5-16
SCALE: AS SHOWN	

INCORPORATED  
EFFECTIVE:  
JUL 30 1997  
UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE

**APPENDIX 5-22**

**CRANDALL CANYON MINE SITE RECLAMATION PLAN**

4/97 Revised 5/97



# CRANDALL CANYON MINE SITE RECLAMATION PLAN

## Phase 1

The reclamation of the disturbed areas of the Crandall Canyon mine site is described in outline and detail below. This description is based upon discussions in the text of Chapters 2, 3, 4, 5, 7 which address the regulations regarding reclamation requirements. In the interest of clarity, the following discussion describes the reclamation process in terms of several general areas within the mine yard. Refer to Figure 1 in this Appendix. Within each of these general areas, reclamation will follow a general sequence of 1) demolition, 2) backfilling, grading and topsoil application, 3) reclamation and revegetation. However, in practice, reclamation will be performed in several of these areas simultaneously. **The final step, reclamation and revegetation, for all the areas will not be done until the fall.**

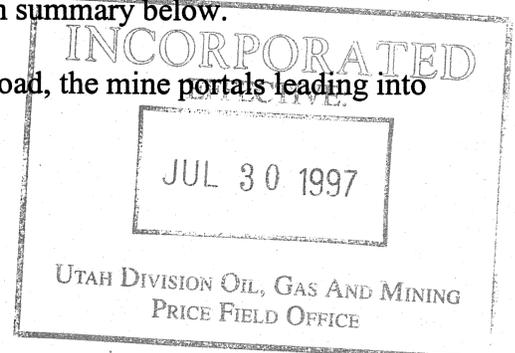
Following Phase 1 reclamation, the only structures to remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Genwal recognizes that development of a feasible reclamation plan for final reclamation of the expansion area containing the best available reclamation methodology is an essential part of this permitting process. Therefore, Genwal has contacted consultants with revegetation and reclamation experience to gather together the best reclamation techniques for reclamation of the steep-slope area. JBR Environmental Consultants, who has had prior experience with reclamation in difficult areas, has provided a letter detailing reclamation methodology that they believe will contribute to the successful reclamation of this area. This letter, included as Attachment 1, was written in response to Genwal's discussions held with JBR as the reclamation plan was being revised. Genwal feels that incorporation of the various reclamation techniques that JBR has identified as being successful in past situations will greatly enhance the success of this reclamation effort. Genwal also recognizes that in the time between now and when final reclamation is actually done, technology may evolve new and better reclamation ideas. Genwal commits to modifying the reclamation plan prior to final reclamation should better reclamation products and methodology become available. This reclamation plan will be reviewed prior to implementation to incorporate applicable methodology and techniques which are considered best technology currently available (BTCA) at the time of reclamation.

## Area Descriptions

The reclamation plan has been divided into several general areas for the purpose of explanation. It is likely that reclamation efforts will occur in multiple areas during the same time interval. These areas are depicted on Figure 1 and described in summary below.

**Portal Area:** The Portal Area consists of an inclined access road, the mine portals leading into the underground mine, and structures in this area.



**Expansion Area:** In 1997, the surface facilities will have been expanded to the area south of the Forest Service road by culverting approximately 1,500' of Crandall Canyon through a 72" bypass culvert. Earthen fill material will have been trucked in to construct the Expansion Area. The truck loadout facilities will have been relocated to the Expansion Area along with the Overhead Conveyor, Stacking tube, Reclaim Tunnel and Conveyor, Crusher Building, MCC Building, Substation, and other associated structures. The fill from the Expansion Area will be utilized during final reclamation to restore approximate original contour in areas of cuts and highwalls. This fill will consist of 8" x 0" earth and rock material obtained from an approved off-site borrow area.

The Expansion Area has been divided into a North Slope Expansion Area and South Slope Expansion Area for the purposes of the reclamation discussion. The North Slope Expansion Area is that area north of the existing Crandall Creek and south of the existing Forest Service road. The South Slope Expansion Area includes the steeper hillside located south of the existing Crandall Creek. Due to the steep slopes encountered on the South Slope, special reclamation procedures have been prescribed for this area. Much of the reclamation plan designed for the South Slope is based on input from reclamation specialists who have experience in steep-slope reclamation situations.

**Old Substation Area:** The Old Substation Area the pad that was originally constructed in the northern part of the mine yard above the shop for a substation. However, the substation was never constructed at this location. Other than an existing powerline, there are no facilities on this site to be removed and the area has had interim revegetation.

**Old Loadout Area:** The Old Loadout Area is located adjacent to and just north of the Forest Service road and the new loadout. This is the area where coal was previously stockpiled and loaded into trucks prior to construction of the 1997 expansion area.

**Forest Service Road:** The Forest Service Road runs east-west through the mine site. The road is to be kept in place following reclamation activities but will undergo a change in width.

**Shop Area:** The Shop Area is located west of the mine portal area and north of the Forest Service Road. Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt.

## **RECLAMATION PLAN OUTLINE**

1. Demolition and Removal of Surface Facilities - Portal Area
2. Removal and Disposal of Expansion Area Fill Material inside Mine Portals
3. Seal and Backfill Portals
4. Backfill, Grade and Topsoil - Portal Area
5. Revegetation - Portal Area
6. Demolition - Old Substation Area
7. Backfill, Grade and Topsoil - Old Substation Area
8. Revegetation - Old Substation Area
9. Demolition and Removal of Surface Facilities - Shop Area
10. Backfill, Grade and Topsoil - Shop Area
11. Revegetation - Shop Area
12. Demolition and Removal of Surface Facilities - Old Loadout Area
13. Backfill, Grade and Topsoil - Old Loadout Area
14. Revegetate - Old Loadout Area
15. Reclaim Forest Service Road North of Expansion Area
16. Demolition and Removal of Surface Facilities - Expansion Area
17. Removal of Fill Material and Recontouring - Expansion Area
18. Restoration of South and North Hillside Slopes - Expansion Area
19. Revegetation - South Slope of Expansion Area
20. Removal and Disposal of 72" Culvert
21. Topsoiling - North Slope of the Expansion Area
22. Revegetation - North Slope of the Expansion Area
23. Restoration of the Stream Channel
24. Revegetation of the Stream Channel
25. Sediment Control and Treatment
26. Topsoil Stockpile Reclamation
27. Phase 2 Reclamation

Note: A Reclamation Timetable has been provided at the end of this discussion.

## **RECLAMATION PLAN DETAIL**

### **1. Demolition and Removal of Surface Facilities - Portal Area**

When mining operations have been permanently ceased and the portals and surface facilities are no longer needed to support the mine, all buildings and other structures will be dismantled and hauled off site to an approved landfill. Reusable materials will be salvaged and recycled to the extent possible.

At the Portal Area, facilities to be removed are: underground bath house, mine fan, fan transformer (portable), belt transfer station, guard rail at top and along access road, water pipelines, and the diversion culvert above portals.

The existing shotcrete above the portal road, above the portals and above the old coal loadout area, along with wire mesh, clips and other similar materials will be removed and disposed of in an appropriate state approved landfill.

All combustible materials will be removed from the underground bathhouse and hauled to an approved solid waste landfill. Any structures that would interfere with sealing of the portals, such as beltline structure, would also be removed.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

### **2. Removal and Disposal of Expansion Area Fill Material inside Mine Portals**

At the same time the structures in the portal area are being demolished and removed, the other surface facility structures located on the Expansion Area (truck loadout, conveyors, crusher building, etc.) will also be removed. After the removal of these structures from the Expansion Area, excess fill material from this area will be taken inside the mine entries for permanent placement [note: reclamation of the Expansion Area is described in greater detail later in this plan]. Fill material, in excess of that needed for backfilling the Portal Area, Shop Area and Old Loadout Area (an estimated 20,410 loose cubic yards, Table 5-20-10 in Appendix 5-20) will be loaded, hauled and disposed of underground in the mine workings (see Figure 1 in Appendix 5-20 for the disposal area in the mine workings.)

The equipment used in the performance of this step would be a l-h-d unit (scoop), dozer w/ripper, and a front end loader.

### 3. Seal and Backfill Portals

Upon the completion of the disposal of the excess Expansion Area fill material in the mine workings, the portals will be sealed and backfilled. The four portals on the north side are: bath house entrance, intake air entry, belt entry and fan (return air) entry. The three portals on the south side are the intake, belt and fan entries. The seals will be constructed approximately 25-35 feet in by from the portal openings and will be built according to MSHA regulations. Equipment necessary for sealing would be a cement mixer and hand tools. After finishing the construction of the seals, the 25 to 35 feet of entry from the portals to the seals will be backfilled with additional fill material from the Expansion Area.

### 4. Backfill, Grade and Topsoil - Portal Area

Once the portals have been sealed and backfilled, reclamation work can then commence on the Portal Area. This work consists of backfilling the cuts to approximate original contour, placing topsoil on the backfilled area and seeding the topsoiled area. Since the Portal Area (and the associated access road) is on a slope, this work will be done in short segments starting at the eastern-most (upper-most) portion of the area and working westward across the portal area and thence down the access road to the Shop Area. Fill material from the Expansion Area will be utilized to backfill and reclaim the highwall area. The fill material will contain rock fragments of all sizes, including a significant amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will be topped with 12" of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill in highwall and yard areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material up to the Portal Area. The lifts will be built up horizontally with a slight slope on each lift toward the highwall. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is put in. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. **Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and either disked or hand-raked into the soil (depending on the steepness of the slope).**

Areas to receive topsoil will be marked with stakes indicating the depth of application. A  
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reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

#### **5. Revegetation - Portal Area**

Revegetation procedures for the Portal Area and the south portal pocket cuts involves a **four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

#### **6. Demolition - Old Substation Area**

The only structures existing at the Old Substation Area is the termination structure for the mine powerline. This powerline will be dismantled and removed from the site prior to completion of final reclamation.

#### **7. Backfill, Grade and Topsoil - Old Substation Area**

As excess fill from the Expansion Area is placed in the underground mine workings, additional fill from the Expansion Area will be hauled to the Old Substation Area for backfilling. The cut slope above the pad will be backfilled to the approximate original contour. The area will then be topsoiled and revegetated.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

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## **8. Revegetation - Old Substation Area**

Revegetation procedures for the Old Substation Area involves a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch** the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, **4) plant containerized stock** to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

## **9. Demolition and Removal of Surface Facilities - Shop Area**

Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt. All structures will be removed from the site. Some components will be salvaged and recycled. Non-salvageable material will be disposed of in an approved solid waste landfill. All asphalt removed from the site will be disposed on in an approved RCRA disposal site.

A portion of the retaining wall which separates the Shop Area from the Forest Service Road will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

## **10. Backfill, Grade and Topsoil - Shop Area**

With the Portal Area and Old Substation Area reclamation completed, and the retaining wall removed, the reclamation activities can continue at the Shop Area. Although this area is not as steep as the previous areas, the same reclamation procedures will be used. The cut slope behind the shop will be backfilled to approximate original contour using fill material from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis

conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

### **11. Revegetation - Shop Area**

Revegetation procedures for the Shop Area involves a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, **4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

### **12. Demolition and Removal of Surface Facilities - Old Loadout Area**

At the time of final reclamation, the facilities at the Old Loadout Area will have already been removed and disposed of as part of the 1997 Surface Expansion Project. All asphalt removed from the site will be disposed on in an approved RCRA disposal site. A portion of the existing coal pile retaining wall will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, and truck with flat bed trailer.

### **13. Backfill, Grade and Topsoil - Old Loadout Area**

With the retaining wall removed, reclamation activities can continue at the Old Loadout Area. The same reclamation procedures will be used as described previously. The cut slope behind the retaining wall will be backfilled to approximate original contour using fill material

from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

#### **14. Revegetation - Old Loadout Area**

Revegetation procedures for the Old Loadout Area involves a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch** the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, **4) plant containerized stock** to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

#### **15. Reclaim Forest Service Road North of Expansion Area**

The Forest Service road from the trailhead/turnaround will be reclaimed according to the Special Use Permit. As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the asphalt road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt removed from the permit area as part of this road narrowing will be taken to a approved RCRA disposal site. The reclaimed area will be topsoiled and revegetated as described above.

Based on recent correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. This position differs from the stipulations of the existing Forest Service Special Use Permit that requires that a 14' asphalt running surface be left in place upon final reclamation. Genwal commits to reclaiming the road through the minesite to any standard desired by the Forest Service at the time of final reclamation. At the present time, however, it is difficult for Genwal to commit to a reclamation standard for the road that is contrary to the existing Forest Service Special Use Permit.

#### **16. Demolition and Removal of Surface Facilities - Expansion Area**

The facilities to be removed from the Expansion Area are: the overhead conveyor, stacking tube, reclaim vault and tunnel/escapeway tube, crusher building, MCC building, loadout conveyor, truck loadout and loading platform. Removal of these facilities will take place simultaneously with removal of facilities from the aforementioned areas. After these surface facilities are removed, the only structures that will remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

#### **17. Removal of Fill Material and Recontouring - Expansion Area**

Reclamation of the Expansion Area (which includes the south portal access ramp) is different from the other reclaimed areas because restoration of the approximate original contour involves removal of fill material rather than placement of backfill material. As described in the preceding sections, fill material removed from the Expansion Area will be used to regrade and restore approximate original contour at the Portal Area, Old Substation Area, Shop Area, and the Old Loadout Area. Therefore, these reclamation operations will be accomplished simultaneously. Expansion Area fill that is not slated for use as backfill for the aforementioned areas (i.e. excess fill) will be disposed of in the underground mine workings as described previously.

Reclamation of the Expansion Area involves three separate procedures involving three separate areas: the North Slope of the Expansion Area, the Crandall Creek Channel Area, and the South Slope of the Expansion Area. As described previously, the North Slope Expansion Area is that area north of the existing Crandall Creek and south of the existing Forest Service road. The South Slope Expansion Area includes the steeper hillside located south of the existing Crandall Creek and the south portal area. The Crandall Creek Channel Area is the area within and immediately on either side of the existing creek channel.

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Reclamation of the North Slope Expansion Area will follow the normal reclamation procedures described above for the other general areas (i.e. regrading, topsoiling and revegetation). Reclamation on the steeper than normal slopes of the South Slope Expansion Area will involve a different reclamation technique which is designed to revitalize the existing left-in-place topsoil. Reclamation of the Crandall Creek Channel Area is also designed to revitalize the existing left-in-place topsoil and restore the previous channel morphology.

#### **18. Restoration of South and North Hillside Slopes - Expansion Area**

*Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the techniques and practices being proposed for the Expansion Area. This consultation will include forming a task force of members with various areas of reclamation expertise to review the reclamation plan and recommend the best and most suitable reclamation techniques and products available at that time. The review and consultation will re-assess and revise, where needed, the existing reclamation plan to provide the best and most appropriate reclamation measures for the site.*

*At the time of final reclamation, all surface facilities located on the Expansion Area pad will be disassembled and removed from the site. In the area of the (then removed) coal stockpile, all coal will be removed from the small adjacent slope area where the south flank of the coal pile had previously rested. Prior to reclaiming this area, all coal fines will be vacuumed from the surface. Using the existing pad as a work surface, a 12" layer of topsoil will then be reapplied to the disturbed area. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.*

*Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and hand-raked into the soil.*

*Revegetation procedures for this area will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock*

*will be planted in the second year of reclamation.*

Following the surface facility demolition activities, fill material will be removed from the Expansion Area in approximately 5'-10' lifts. During the fill removal process, the culvert inlet structure will be left in place on the west end of the yard to continue the diversion of water through the 72" culvert. A 40 foot wide berm will be left intact at the culvert inlet to continue to serve as the culvert headwall and to continue to divert water into the 72" culvert.

The sequence for removing the fill material, culvert, and underdrain system from the Expansion Area will be essentially the same as during the 1997 construction process but in reverse order. (See construction details in Appendix 7-50).

Fill will be removed from the Expansion Area in 5'-10' lifts starting from the west end of the yard and proceeding to the east end. At the intersection of the South Slope and the pad fill the marker soil/geotextile fabric will be located. The marker soil will be carefully removed from on top of the geotextile fabric on the South Slope as the yard fill is being removed. This will allow reclamation to be done on vertical increments of the hillside that will be easy to access from the adjacent yard level. Removal of fill material adjacent to the South Slope will be done very carefully in order not to disturb the in-place soil resources. Fill removal in this area will be done with small earth-moving equipment (Bobcats, backhoes, etc.) and/or by hand if necessary in order to minimize disturbance of the topsoil. Once the geotextile fabric has been exposed, the fabric will be carefully peeled away from the soil and the condition of the underlying soil materials observed at this time. The soil will be reclaimed and revegetated in 5-10 foot horizontal zones that can be easily accessed and worked by hand from the adjacent pad fill level. After each level has been reclaimed as described below, another lift (5-10 feet of fill) will be removed from the fill. Revegetation work will continue on the next increment of hillside below the previously reclaimed level. This work will be done in continued successive lifts, involving fill removal, peeling away the geotextile, revitalization of the in-place topsoil, and revegetation of the newly exposed increment.

It should be noted that approximate original contour of the North Slope of the Expansion Area will also be re-established as the Expansion Area fill is being removed in lifts as described previously. As the fill is being removed in vertical lifts, the adjacent North Slope surface will be regraded and prepared for subsequent topsoil application.

Sediment control during fill excavation will be met by continued use of the sediment pond east and downstream from the yard area. The main 72" culvert inlet and an adequate amount of fill to maintain the existing headwall will be left intact during this phase of the fill retrieval process.

## **19. Revegetation - South Slope of the Expansion Area**

Reclamation of the South Slope will take place in vertical increments (lifts) simultaneously with the removal of the fill material in corresponding lifts. As fill lifts are being

removed, the adjacent newly exposed hillside will be reclaimed and revegetated.

It is anticipated that after the Expansion Area fill is removed in lifts and the geotextile fabric is peeled away in vertical increments, the underlying soil material could be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration. This treatment will be applied in successive 5-10' lifts as the fill is removed and the hillside is exposed.

The re-exposed soil structure will most likely be undamaged but lacking in microbes and nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil the non-riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater).

By removing the fill in 5'-10' lifts and simultaneously reclaiming the adjacent South Slope in corresponding lifts, the pad area can then serve as convenient operating platform for the machinery and supplies used during the reclamation effort. In this manner heavy machinery will not be required to maneuver on the steep slopes. All reclamation work performed directly on the steep slopes will be done with hand labor and tools. The reclamation process will be supported by heavy equipment staged on the adjacent pad level.

## **20. Removal and Disposal of 72" Culvert**

During the 1997 construction of the expanded surface facilities, the creek channel configuration was left intact throughout the entire length of the Expansion Area. This was accomplished by covered the channel in situ with a geotextile fabric during initial construction period. The geotextile was placed over the channel to preserve the indigenous soil and morphology of the existing creek bed. The fabric was placed along the bottom and 5 feet above the channel embankment. A colored marker material was placed on top of the geotextile to serve as a visual marker horizon during reclamation operations.

Fill removal (and South Slope reclamation) will proceed vertical lifts until the 72" culvert has been exposed. Prior to removing the culvert, the stream flow will be diverted into the 18" underdrain system by removing the cap from the drain pipe located at the upstream end of the culvert. This will be done during a low flow period of the year, such as July or August. Once the streamflow has been successfully diverted into the underdrain system, removal of the 72" culvert can begin. Removal of the culvert will be done in 20' segments starting from the

upstream end and working downstream. All culvert material will be removed from the site and disposed of in an approved landfill. The remaining culvert bedding material (2" x 0" gravel), which is located on top of the underdrain system, will be left in place at this time to provide a stable work area for heavy equipment involved in subsequent reclamation of the North Slope as described later in this discussion.

The 72" culvert will be removed downstream to an elevation just above the sediment pond. At this time, a new culvert inlet and headwall will be re-established for the remaining 72" culvert segment. The headwall will be rebuilt at this location according to original headwall design and will be rip rapped in a similar manner. At this stage of the reclamation process, approximately 1,100' of 72" culvert will have been removed and approximately 400' still remains in place below and around the left-in-place sediment pond. However, stream flow will still continue to flow temporarily through the underdrain system at this time until the North Slope reclamation has been completed.

## **21. Topsoiling - North Slope of the Expansion Area**

After the Expansion Area fill and the 72" culvert have been removed, the underdrain system will still remain intact. Because this phase of work will be done during low flow, the stream will be adequately carried through the underdrain system. Mobile earthmoving equipment will still be able to operate on top of the 2" x 0" bedding material located over the underdrain system. Reclamation of the North Slope, which is not as steep as the south slope, will be done with the standard protocol for reclamation involving topsoiling and revegetation.

Topsoil will be reapplied to the North Slope in the conventional manner. Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

## 22. Revegetation - North Slope of the Expansion Area

Revegetation procedures for the North Slope of the Expansion Area involves a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need)**, 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

## 23. Restoration of the Stream Channel

After the north slope has been topsoiled, the underdrain system will then be removed and the stream channel morphology restored. Prior to removal of the underdrain, silt fences will be established in Crandall Creek downstream from the existing 72" culvert outlet. These silt fences will be located in an area convenient for maintenance and cleanout.

Removal of the underdrain system will be done during low flow conditions and will be completed in reverse order from the way it was originally installed. Using small mobile equipment, such as a backhoe, the remaining culvert bedding material, drain rock and 18" drain pipe will be removed in 20' segments starting from the upper end and working downstream. After the drain rock and drain pipe are removed, the lower layer of geotextile can be carefully peeled back, re-establishing the "natural" streambed in the process. All drain rock, drain pipe and geotextile material removed during this process will be disposed of at an approved landfill. As each 20' segment of the underdrain system is removed, silt fencing will be installed on either side of the newly restored stream channel. The purpose of this silt fencing is to treat drainage from the adjacent recently reclaimed areas.

After the underdrain system has been removed and the stream channel re-established downstream past UD-1, a rip rapped ditchway will be installed to carry drainage from the side culvert outlet down the North Slope to the restored stream channel. Refer to Plate 5-16.

The underdrain system will be removed downstream to an elevation just above the sediment pond at the location of the new 72" culvert inlet and headwall. At this time, the remaining 18" drain pipe will be recapped and the stream flow rediverted back into the 72" culvert. [Note: this new sediment pond/culvert/underdrain configuration will remain in place until Phase 2 reclamation, as described later]. At this stage of the reclamation process, approximately 1,100' of 72" culvert and underdrain system will have been removed and approximately 400' will still remain in place to divert channel flow below and around the left-in-place sediment pond.

## 24. Revegetation of the Stream Channel

It is anticipated that after the underdrain system is removed and the geotextile fabric is peeled away, the underlying soil material along the stream banks will be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration.

The re-exposed soil structure will most likely be undamaged but lacking in microbes and nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil, the riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater).

## 25. Sediment Control and Treatment

In practice, many of the reclamation procedures outlined above will be conducted simultaneously. However, the sediment pond will provide complete sediment control during all phases of the reclamation process until such time as the upper 1,100' segment of 72" culvert has been removed and removal of the underdrain system begins. Sediment control during removal of the underdrain will consist of silt fences constructed on either side of the newly restored stream channel and silt fences constructed within Crandall Creek below the outlet of the 72" culvert.

## 26. Topsoil Stockpile Location Reclamation

Following the removal of the topsoil stockpiles from the storage sites (during final reclamation retopsoiling activities), the topsoil pile locations will be reclaimed. (Enough topsoil will remain stockpiled for Phase 2 reclamation. Refer to the Phase 2 reclamation discussion in item #27 below.) The topsoil stockpile locations will not require soil redistribution since the native topsoil is still in place. At these locations, the ground will be lightly scarified and then reclaimed according to the standard reclamation protocol.

Revegetation procedures for the stockpile locations will involve a **four step** program: **1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch** the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, **4) plant containerized stock** to further stabilize the soil and provide vegetative diversity. **Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to**

**mark the area of coverage) during application to the redistributed topsoil.** All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. **Revegetation work will not be done until fall (September-October).**

## **Phase 2**

### **27. Phase 2 Reclamation - Removal of Sedimentation Pond**

During Phase 2 reclamation, prior to any earthwork activity, silt fences will be installed across the entire length of the downstream at the east end of the sediment pond embankment to filter any sediment resulting from removal of the pond. Additional silt fences will be installed in Crandall Creek below the culvert outlet to provide additional sediment control.

Removal of the sediment pond and the remaining 72" culvert/underdrain system will follow the same procedures described previously for the removal of the expansion area fill. The pond embankment will be removed in lifts down to the 72" pipe. Reclamation (grading, topsoiling and revegetation) of the North and South Slopes will be done in the same manner as described for the Expansion Area in Phase 1 reclamation. After the 72" culvert has been exposed the end cap will be removed from the 18" drain pipe located in the underdrain system. Flow will then be diverted through the underdrain system in the drain rock below the 72" pipe. The 72" pipe will be completely removed at this time.

After the 72" pipe has been completely removed, the geotextile fabric will be removed from the top of the underdrain system. The drain rock and 18" drain pipe will be removed with a small backhoe and hauled off-site for disposal. The drain rock beneath the drain pipe will be shoveled out of the channel and the geotextile that was placed over the original channel will be removed by hand, restoring the original stream channel morphology. The disturbed area will be revegetated in the manner previously described for the previously reclaimed areas. In many ways Phase 2 reclamation of the sediment pond embankment will be nearly identical to the Expansion Area reclamation described previously for Phase 1. Both areas involve the steeper South Slope, the stream channel culvert/underdrain system, and the less steep North Slope. Therefore, all pertinent aspects of reclamation which apply to Phase 1 as described in this appendix will also apply to Phase 2. This includes the special steep-slope reclamation techniques for the South Slope, the left-in-place soil revitalization for the channel area, and the standard reclamation procedures for the North Slope.

**RECLAMATION TIME TABLE  
CRANDALL CANYON MINE**

RECLAMATION OPERATION	MAY				JUNE				JULY				AUGUST				SEPTEMBER				OCTOBER			
	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4
<b>PORTAL AREA</b>																								
Remove structures																								
Remove asphalt																								
Haul earthfill into mine workings																								
Seal portals																								
Backfill, regrade, recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SUBSTATION AREA</b>																								
Remove structures																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SHOP</b>																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD LOADOUT AREA</b>																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>FOREST SERVICE ROAD</b>																								
Remove asphalt																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - NORTH SIDE</b>																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Re-establish drainage ditches and rip rap																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - SOUTH SIDE</b>																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Remove marker material, geotextile																								
Revitalize existing topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - STREAM CHANNEL</b>																								
Remove 72" CMP																								
Remove underdrain and geotextile																								
Revitalize existing topsoil																								
Re-establish culvert inlet/headwall																								
Seeding/mulching																								

INCORPORATED  
EFFECTIVE:

JUL 30 1997

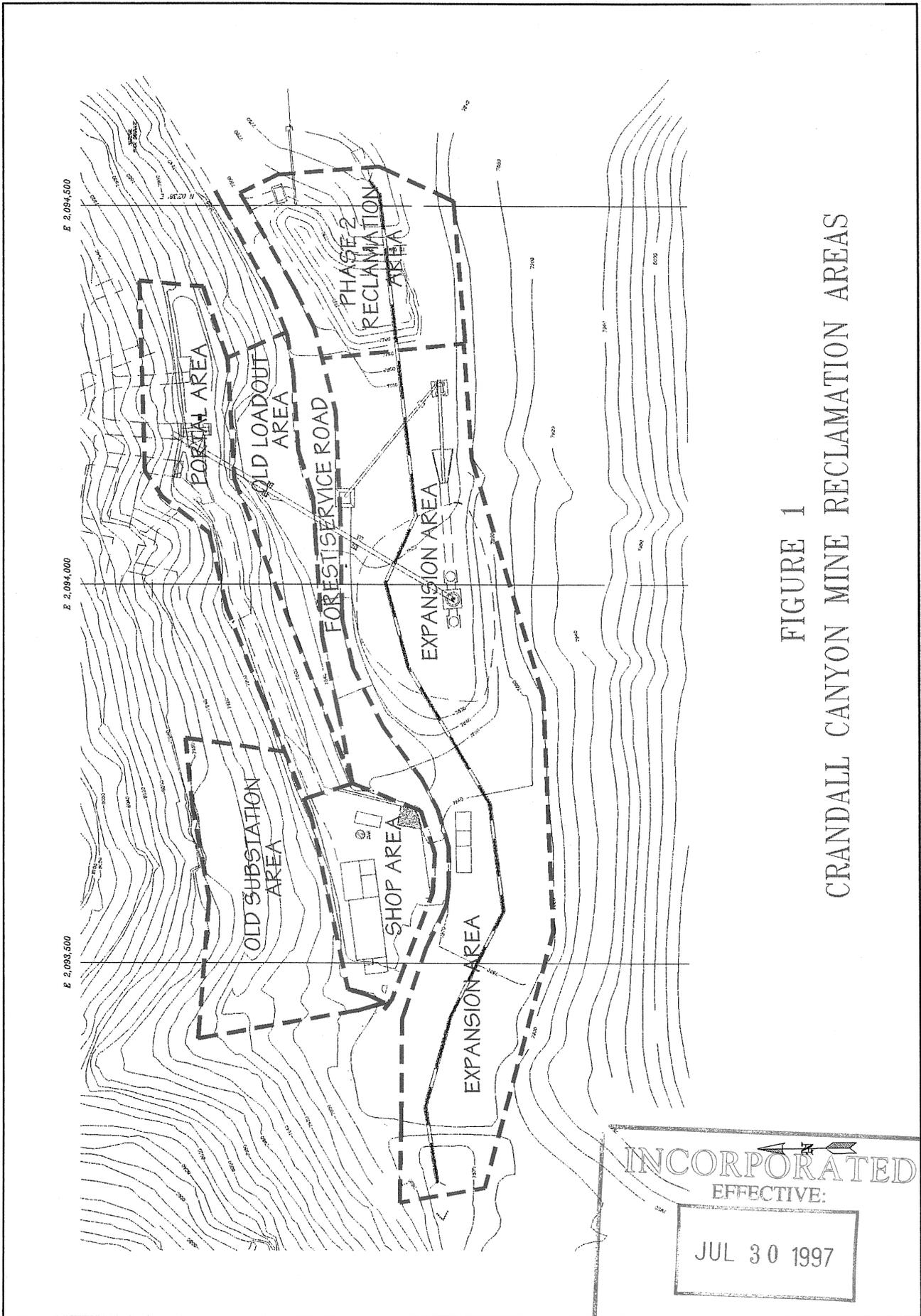


FIGURE 1  
 CRANDALL CANYON MINE RECLAMATION AREAS

INCORPORATED  
 EFFECTIVE:  
 JUL 30 1997  
 UTAH DIVISION OIL, GAS AND MINING  
 PRICE FIELD OFFICE

ATTACHMENT 1

JBR ENVIRONMENTAL CONSULTANTS, INC.  
RECLAMATION RECOMMENDATION LETTER

Jean M. Semborski  
Andalex Resources Inc.  
Project Engineer  
P.O. Box 902  
Price, UT 84501

May 22, 1997

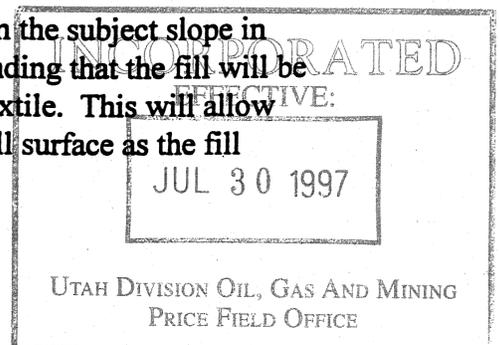
RE: Crandall Canyon Culvert Reclamation Plan ACT/015/032

Dear Ms. Semborski:

This is to your request of May 16, 1997 regarding the reclamation plans for the site of Genwal's proposed fill and culvert in Crandall Canyon. Based on our discussions, and my review of your reclamation plan on May 15, 1997, I believe the main topics of interest in the proposed reclamation plan are:

- 1) The existing soil horizon in the canyon that would be covered by the fill will be removed from the surface environment for a number of years as well as being compacted to various degrees by the overlying fill. Extended burial of the soil may affect its density by compaction and may reduce the viability of the soil micro fauna by compaction and reduction of oxygen.
- 2) The north-facing slope under the fill is steep and erosion may be a problem if normal, mechanized seedbed preparation (scarifying and gouging) is conducted which disturbs the soil and may make it more prone to erosion.
- 3) Use of sewage sludge or chemical fertilizer to amend the soil must be done carefully or it may result in contamination of the adjacent stream.
- 4) Prevention of erosion of the soil after seeding is important because of the nearby stream channel.

My general recommendation is that Genwal should propose to reclaim the subject slope in sections as it is being exhumed from under the fill. It is my understanding that the fill will be removed in lifts to allow careful removal of the marker soil and geotextile. This will allow convenient access to all areas of the treated slope from the adjacent fill surface as the fill elevation is gradually reduced.



J. Semborski Letter

May 22, 1997

Page 2

The seedbed preparation and seeding should be done with hand labor using hand rakes to lightly scarify the top inch or so of the soil surface, broadcast seed and fertilizer. This light hand work will produce a suitable seedbed for the seed and will thoroughly allow incorporation of the fertilizer into the seedbed. The hand raking should not be so deep as to destabilize the overall soil horizon.

Material such as polyacrylamide (PAM) can be added to the soil to chemically open up the soil for air and water penetration. However, I do not think that the compacted density of the soil immediately after it is exhumed should be much of a hindrance to long-term revegetation success. First of all, most of the soil will be buried under less than the full height of the fill thus the degree of compaction will not be uniform. The soil on the upper portions of the slope will be much less compacted than the soil at the bottom of the slope. Secondly, assuming that the reclamation and reseeding is done in the fall, the soil will be loosened over the winter and early spring by the effects of the weather before germination of the seeds. I would expect the combined effects of frost heave, moisture penetration, and burrowing animals during that first fall, winter, and early spring to naturally mitigate much of the original compacted density.

Erosion control material should be applied after preparation of the seedbed is completed. Hydraulically applied fiber mulch with tackifier and/or bonded fiber matrix should be effective in controlling erosion and may be more cost effective than stapled fiber matting.

With regard to the potential lack of viability of the soil because of its burial, I am not sure that this effect will materially affect the potential revegetation success, using the methods described above. I am familiar with successful revegetation of disturbed mining surfaces where there is no topsoil present. I am aware of materials such as mill tailings, waste rock, alluvium, road base, and heap leach waste that have been successfully revegetated without application of topsoil. These materials are typically enhanced with the use of fertilizer to help support the initial vegetation growth. In these cases, the material used as growth medium did not have the soil micro-fauna typically associated with topsoil, yet the vegetation became well established with chemical fertilizer addition. I have also observed many highway road cut sites where the seedbed was recently exhumed from its previous burial under significant overburden and these slopes have subsequently been revegetated.

In my experience, the main limitations to successful revegetation are lack of suitable soil texture, inadequate chemical nutrients in the growth material, and lack of moisture. In your case, the initial soil texture (gradation) should be unchanged by the burial. Lack of nutrients in the exhumed soil could be determined with sampling and mitigated with chemical fertilizer but its application would have to be carefully planned and carried out to reduce the potential for contamination of the nearby stream from the fertilizer. The location of the soil in question on a north-facing slope at higher elevations should indicate that sufficient moisture for vegetation growth is likely.

J. Semborski Letter

May 22, 1997

Page 3

The micro-fauna of the topsoil in question at the Crandall Canyon site may be reduced in numbers and diversity by burial but the soil should still possess suitable gradation, chemical nutrient content and moisture for the above-described reasons. This material should therefore provide a suitable growth material for revegetation. The compacted soil may benefit from use of a mycorrhizal inoculum but even this may not be necessary for the initial establishment of a vegetation cover. The soil micro-fauna will eventually be naturally re-established by the affects of the growing vegetation and exposure to the surface environment. This may be accelerated up with use of a suitable cover crop.

I believe that future revegetation of the slope in question at the Crandall Canyon site should be readily feasible if the recommendations contained in this letter are followed.

Thank you for calling on JBR to assist you with this project. Please call if you have any questions on my recommendations.

Best Regards,

A handwritten signature in cursive script, appearing to read "Brian W. Buck".

Brian W. Buck

Vice President

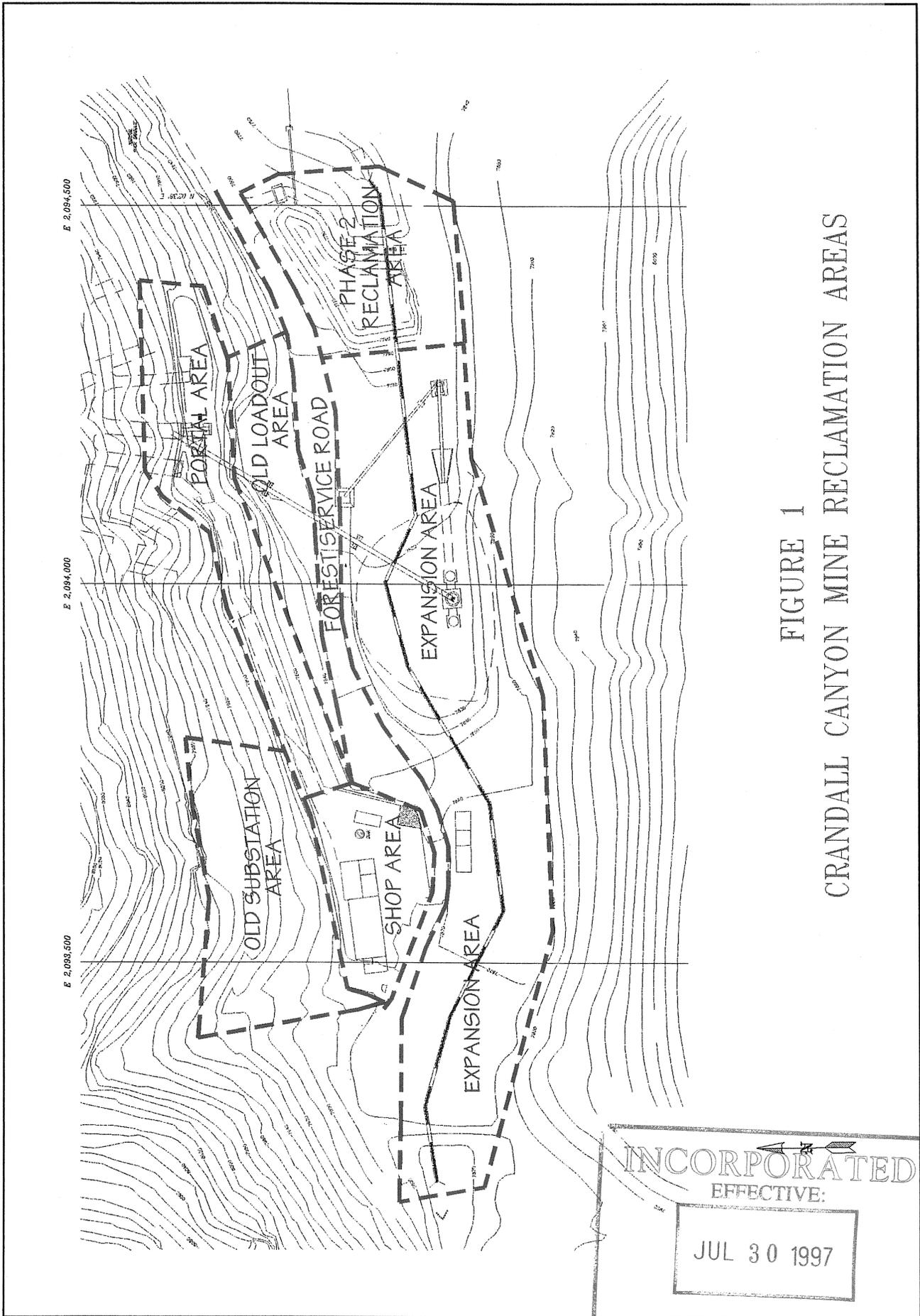


FIGURE 1  
CRANDALL CANYON MINE RECLAMATION AREAS

INCORPORATED  
EFFECTIVE:  
JUL 30 1997  
UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE

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May 22, 1997

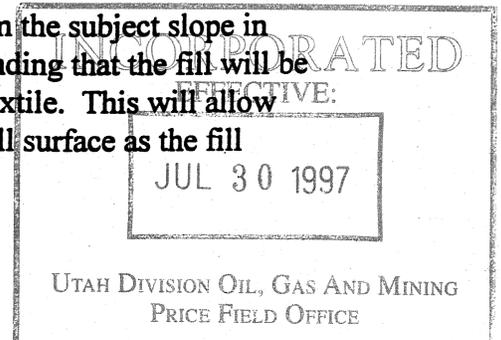
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Best Regards,



Brian W. Buck

Vice President

**APPENDIX 5-23**

**AIR QUALITY PERMIT AMENDMENT  
SOUTH PORTALS**

**INCORPORATED**

**APR 02 2003**

**DIV OF OIL GAS & MINING**

4/05/2003

**APPENDIX 5-23**

**AIR QUALITY PERMIT AMENDMENT  
SOUTH PORTALS**

**INCORPORATED**

**APR 02 2003**

**DIV OF OIL GAS & MINING**

4/05/2003



# Utah!

Where ideas connect

Department of Environmental Quality  
Division of Air Quality

Appendix 5-23

Michael O. Leavitt  
Governor

150 North 1950 West  
P.O. Box 144820

Dianne R. Nielson, Ph.D.  
Executive Director

Salt Lake City, Utah 84114-4820  
(801) 536-4099 Fax

Richard W. Sprott  
Director

(801) 536-4414 T.D.D.  
[www.deq.utah.gov](http://www.deq.utah.gov)

DAQE-AN0225003-03

March 20, 2003

Dave Shaver  
Genwal Resources Incorporated  
P. O. Box 1077  
Price, Utah 84526

Dear Mr. Shaver:

Re: Approval Order: Modification of Existing Approval Order DAQE-827-01 to Add Equipment,  
Emery County - CDS B; ATT; NSPS, HAPs, TITLE V  
Project Code: N0225003

The attached document is the Approval Order (AO) for the above-referenced project.

Future correspondence on this Approval Order should include the engineer's name as well as the DAQE number as shown on the upper right-hand corner of this letter. Please direct any technical questions you may have on this project to Mr. M. Maung. He may be reached at (801) 536-4153.

Sincerely,

Richard W. Sprott, Executive Secretary  
Utah Air Quality Board

RWS:MM:re

cc: Southeastern Utah District Health Department

INCORPORATED  
APR 02 2003  
DIV OF OIL GAS & MINING

**STATE OF UTAH**

**Department of Environmental Quality**

**Division of Air Quality**

**APPROVAL ORDER: MODIFICATION OF EXISTING  
APPROVAL ORDER DAQE-827-01, TO ADD EQUIPMENT**

**Prepared By: Maung Maung, Engineer  
(801) 536-4153  
Email: mmaung@utah.gov**

**APPROVAL ORDER NUMBER**

**DAQE-AN0225003-03**

**Date: March 20, 2003**

**Genwal Resources Incorporated**

**Source Contact  
Dave Shaver  
(435) 564-4000**

**Richard W. Sprott  
Executive Secretary  
Utah Air Quality Board**

**INCORPORATED**

**APR 02 2003**

**DIV OF OIL GAS & MINING**

**Abstract**

**Genwal Resources, Inc. located in Emery County has proposed to modify their existing Approval Order DAQE-827-01, to add new equipment and to reduce coal output to 4.3 million tons per year. The company has proposed to construct a portal from the south seam, and to install an additional truss-supported covered conveyor to transfer the coal from the south portal to the location of the existing stacking tube. The equipment currently used from the north portal will remain unchanged.**

**Emery County is an attainment area of the National Ambient Air Quality Standards (NAAQS) for all pollutants. This source is subject to New Source Performance Standards (NSPS) under 40 CFR Part 60 Subpart Y- Standards of Performance for Coal Preparation Plants. Because this source is a NSPS source, it also falls under the 40 CFR Part 70 or CAA Title V regulations. The emissions, in tons per year, will change as follows:  $PM_{10} = - 0.12$ .**

**The change in emissions will result in the following potential to emit totals:  $PM_{10} = 6.86$ ,  $NO_x = 4.57$ ,  $SO_2 = 0.31$ ,  $CO = 3.57$ ,  $VOC = 0.80$ .**

The project has been evaluated and found to be consistent with the requirements of the Utah Administrative Code Rule 307 (UAC R307). A public comment period was held in accordance with UAC R307-401-4 and no comments were received. This air quality Approval Order (AO) authorizes the project with the following conditions, and failure to comply with any of the conditions may constitute a violation of this order.

**General Conditions:**

1. This Approval Order (AO) applies to the following company:

<u>Facility Location</u>	<u>Corporate Office Location</u>
Genwal Resources, Inc. SR 31 Mile Post 33 Huntington Canyon Huntington, Utah 84528 PHONE NUMBER: (435) 687-5420	Genwal Resources, Inc. 794 North C Canyon Road East Carbon, Utah 84520 PHONE NUMBER: (435) 564-4000 FAX NUMBER: (435) 564-4002

The equipment listed below in this AO shall be operated at the following location:

**PLANT LOCATION:**

SR 31 Mile Post 33, Huntington Canyon, Huntington, Utah 84528, Emery County

Direction: Take SR 31 northwest from Huntington, Utah. Follow SR 31 for 33 miles and turn left (west) on to the Forest Service Road. Follow Forest Service Road for two miles up Crandall Canyon to Genwal mine.

Universal Transverse Mercator (UTM) Coordinate System: UTM Datum NAD27  
4,369.0 kilometers Northing, 483.0 kilometers Easting, Zone 12

APR 02 2003

DIV OF OIL GAS & MINING

2. All definitions, terms, abbreviations, and references used in this AO conform to those used in the Utah Administrative Code (UAC) Rule 307 (R307), and Title 40 of the Code of Federal Regulations (40 CFR). Unless noted otherwise, references cited in the AO conditions refer to those rules.
3. The limits set forth in this AO shall not be exceeded without prior approval in accordance with R307-401.
4. Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be approved in accordance with R307-401-1.
5. All records referenced in this AO or in applicable NSPS, which are required to be kept by the owner/operator, shall be made available to the Executive Secretary or Executive Secretary's representative upon request, and the records shall include the two-year period prior to the date of the request. All records shall be kept for the following minimum periods:
  - A. All Records Two years
  - B. Emission inventories Five years from the due date of each emission statement or until the next inventory is due, whichever is longer.
6. Genwal Resources, Inc. shall install the covered conveyor and conduct its operations of the mining activities in accordance with the terms and conditions of this AO, which was written pursuant to the Notice of Intent submitted to the Division of Air Quality (DAQ) on December 19, 2002.
7. This AO shall replace the AO (DAQE-827-01) dated October 1, 2001.
8. The approved installations shall consist of the following equipment or equivalent. Equivalency shall mean identical performance, including any emission discharge, if emissions are involved. It shall be verified and approved by the Executive Secretary before the equipment or the process is changed.
  - A. One Jeffrey 56 feet crusher rated at 800 tons per hour
  - B. One concrete stacking tube, 12 feet in diameter, 85 feet high
  - C. One wheeled loader, one dozer
  - D. Two covered conveyor systems (one new)
  - E. One truck-loadout station, completely enclosed, (for highway vehicles) with surge bin and telescopic chute

**Limitations**

9. Genwal Resources Incorporated shall notify the Executive Secretary in writing when the installation of the equipment listed in Condition #8.D has been completed and is operational, as an initial compliance inspection is required. To insure proper credit when notifying the Executive Secretary, send your correspondence to the Executive Secretary, attn: Compliance Section.

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APR 02 2003  
DIV OF OIL GAS & MINING

If construction and/or installation has not been completed within eighteen months from the date of this AO, the Executive Secretary shall be notified in writing on the status of the construction and/or installation. At that time, the Executive Secretary shall require documentation of the continuous construction and/or installation of the operation and may revoke the AO in accordance with R307-401-11.

- 10. Visible fugitive dust emissions from haul-road traffic and mobile equipment in operational areas shall not exceed 20% opacity. Visible emissions determinations for traffic sources shall use procedures similar to Method 9, but the requirement for observations to be made at 15-second intervals over a six-minute period shall not apply. Six points, distributed along the length of the haul road or in the operational area, shall be chosen by the Executive Secretary or the Executive Secretary's representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made 1/2 vehicle length or greater behind the vehicle and at approximately 1/2 the height of the vehicle or greater. The accumulated six readings shall be averaged for the compliance value.
- 11. The following production limit shall not be exceeded:
  - A. 4,300,000 tons of coal per rolling 12-month period

To determine compliance with a rolling 12-month total the owner/operator shall calculate a new 12-month total by the twentieth day of each month using data from the previous 12 months. The records of production shall be kept on a daily basis. Production shall be determined by examination of company sales records and production records.

**Roads and Fugitive Dust**

- 12. All unpaved roads and other unpaved operational areas which are used by mobile equipment shall be water sprayed and/or chemically treated to reduce fugitive dust. Control is required at all times (24 hours per day every day) for the duration of the project/operation. Records of water treatment shall be kept for all periods when the plant is in operation. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition or unless it is below freezing. The opacity shall not exceed 20% during all times the areas are in use. The records shall include the following items:
  - A. Date
  - B. Number of treatments made
  - C. Rainfall received, if any, and approximate amount
  - D. Time of day treatments were made

INCORPORATED

APR 02 2003

DIV OF OIL GAS & MINING

Records of treatment shall be made available to the Executive Secretary upon request and shall include a period of two years ending with the date of the request.

- 13. The haul road shall be paved and shall be periodically swept or sprayed clean as dry conditions warrant or as determined necessary by the Executive Secretary. Records of cleaning of the paved road shall be kept.

14. Water sprays shall be installed at the following points to control fugitive emissions if the opacity limit can not be maintained:

- A. All crushers
- B. All screens
- C. All conveyor transfer points
- D. All stockpiles
- E. All operation areas

The sprays shall operate whenever dry conditions warrant or as determined necessary by the Executive Secretary.

15. The following limit shall apply to the storage pile:

- A. Size not to exceed - 1.5 acres

The storage piles shall be watered to minimize generation of fugitive dusts as dry conditions warrant or as determined necessary by the Executive Secretary.

#### **Federal Limitations and Requirements**

16. In addition to the requirements of this AO, all provisions of 40 CFR 60, New Source Performance Standards (NSPS) Subparts A and Y, 40 CFR 60.1 to 60.18 and 40 CFR 60.250 to 60.254 (Standards of Performance for Coal Preparation Plants) apply to this installation.

#### **Records & Miscellaneous**

17. At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this Approval Order including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Executive Secretary which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded.
18. The owner/operator shall comply with R307-150 Series. Inventories, Testing and Monitoring.
19. The owner/operator shall comply with R307-107. General Requirements: Unavoidable Breakdowns.

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**APR 02 2003**

The Executive Secretary shall be notified in writing if the company is sold or changes its name.

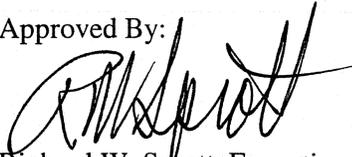
This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including R307.

A copy of the rules, regulations and/or attachments addressed in this AO may be obtained by contacting the Division of Air Quality. The Utah Administrative Code R307 rules used by DAQ, the Notice of Intent (NOI) guide, and other air quality documents and forms may also be obtained on the Internet at the following web site: [http://www.eq.state.ut.us/eqair/aq\\_home.htm](http://www.eq.state.ut.us/eqair/aq_home.htm)

The Potential To Emit (PTE) emissions for this source (the entire plant) are currently calculated at the following values:

<u>Pollutant</u>	<u>Tons/yr</u>
PM <sub>10</sub> .....	6.86
SO <sub>2</sub> .....	0.31
NO <sub>x</sub> .....	4.57
CO .....	3.57
VOC.....	0.80

Approved By:



Richard W. Sprott, Executive Secretary  
Utah Air Quality Board

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APR 02 2003

DIV OF OIL GAS & MINING

**APPENDIX 5-24**

**RESOURCE AND RECOVERY PROTECTION PLAN**

**APPROVAL LETTER**

**INCORPORATED**  
**APR 15 2005**  
**DIV OF OIL GAS & MINING**



## United States Department of the Interior

### BUREAU OF LAND MANAGEMENT

Utah State Office

P.O. Box 45155

Salt Lake City, UT 84145-0155

<http://www.blm.gov>



IN REPLY PLEASE REFER TO:

UTU-78953

(UT-924)

Pamela Grubaugh-Littig  
 Permit Supervisor  
 State of Utah  
 Division of Oil Gas and Mining  
 1594 West North Temple Street, Suite 1210  
 Salt Lake City, Utah 84114-5801

NOV 12 2004

Re: Resource Recovery and Protection Plan (R2P2), Federal Coal Lease Addition, UTU-78953, South Crandall Mine, GENWAL Resources, Inc., C/015/0032

*Pam*  
 Dear Ms. Grubaugh-Littig:

The Bureau of Land Management (BLM) has received and reviewed the subject R2P2 as part of the permit application package for adding Federal coal lease UTU-78953 to the approved Crandall Canyon Mine Permit. This letter documents the BLM's finding for the R2P2. The surface lands associated with the coal lease are National Forest lands.

GENWAL Resources, Inc. has submitted the Permit Application Package (the R2P2 being part of the submission) to add the new South Crandall coal lease (UTU-78953) to the existing Crandall Canyon Mine. New portals to access this lease have been driven into the coal seam on private land on the south side of the canyon. Coal processing and handling will use existing facilities. The addition of the Federal lease constitutes the bulk of the minable coal reserves on the south side of Crandall Canyon and will extend the life of this mine for about 8 years. All mining on this new lease will be by underground mining methods and by access gained from adjacent underground mine workings on private land. The R2P2 mining plans will extend potential longwall and room and pillar panels into the new lease. The R2P2 has been reviewed by this office and has been determined to be complete and a logical plan to mine the Federal coal.

The BLM finds the submitted R2P2 (as conditioned below) is in compliance with the Mineral Leasing Act of 1920, as amended, the lease terms and conditions, the regulations at 43 CFR 3480, and will achieve Maximum Economic Recovery of the Federal coal.

Concern has been raised by the Forest Service about loss of surface waters in areas where two seam full-extraction mining is proposed within Little Bear Canyon with less than 600 feet of overburden. They have expressed their concern that mining in Little Bear Canyon where the

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APR 15 2005

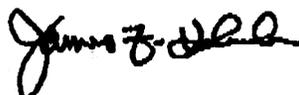
DIV OF OIL GAS & MINING

overburden is less than 600 feet could divert surface waters into the mine workings. This concern has been raised because Little Bear Canyon is designated as a municipal watershed in the Forest Plan.

The BLM recommends the Assistant Secretary approve the R2P2 as proposed by the company, except that full extraction mining in the both seams not be authorized in Little Bear Canyon with less than 600 feet of overburden (in the second panel from the south) until it is determined that both seams can be mined without adverse impacts to the Little Bear Canyon municipal watershed. We will continue to work with the Forest Service to address their concerns. Final approval of which coal seams will be mined in the area in question will be addressed as a modification to the approved R2P2.

If you have any questions, please contact Jeff McKenzie of my staff at (801) 539-4038 or Stephen Falk at the Price Field Office (435) 636-3605.

Sincerely,



James F. Kohler  
Chief, Solid Minerals Branch

cc: Office of Surface Mining  
1999 Broadway, Suite 3320  
Denver, Colorado 80202-5733

Price Field Office/UT-070

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APR 15 2005

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**APPENDIX 5-24A**

**R2P2 (RESOURCE RECOVERY AND PROTECTION PLAN)**

**APPROVAL LETTER**

**(120 ACRE MODIFICATION, FEDERAL LEASE UTU-68082)**

**INCORPORATED**  
**FEB 28 2005**  
**DIV OF OIL GAS & MINING**



## United States Department of the Interior

### BUREAU OF LAND MANAGEMENT

Utah State Office  
P.O. Box 45155  
Salt Lake City, UT 84145-0155  
<http://www.blm.gov>



IN REPLY REFER TO:  
UTU-68082  
U-54762  
(UT-923)

FEB 23 2005

Certified Mail--Return Receipt Requested

Mr. John C. Lewis  
Mining Engineer  
Genwal Resources, Inc.  
P. O. Box 1077  
Price, Utah 84501

Re: Minor Modification, Resource Recovery and Protection Plan (R2P2), Revised Life of Mine Plan, Low-Seam Longwall Panels, East and North Mining Areas, Crandall Canyon Mine

Dear Mr. Lewis:

The Bureau of Land Management (BLM) has received from Genwal Resources, a modification to the subject R2P2. The proposed modification revises mining plans for low-seam areas with the acquisition of low-seam longwall machinery, and updates timing for life of mine recovery. The changes are for Federal coal leases UTU-68082, U-54762, and adjacent State of Utah coal leases.

Genwal plans a number of revisions to the approved R2P2.

1. Convert a previously approved area for room and pillar mining to mine two small longwall panels, #'s 20 and 21. This area is south of West Mains and directly between the old longwall panel # 3 on the west and old works on lease SL-062648 to the east. The area had projected coal heights less than what the previous longwall equipment could mine. The acquisition of low-seam longwall equipment is Genwal's justification for the change.
2. Develop and mine longwall panel # 22 parallel to West Mains and east of old longwall panel # 2. Again, this area originally was projected with seam heights. In addition, Genwal has requested a lease modification for additional coal lands at the eastern boundary of UTU-86082, just west of the outcrop in Huntington Canyon. With the acquisition of low-seam longwall equipment, Genwal will attempt to develop and extend longwall panels into this area.

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3. Probe/develop the area north of planned longwall panel # 22, as shown on Genwal's map of Oct 12, 2004, to ascertain if coal heights will support coal recovery. If probing/development proves a recoverable reserve, a panel plan will be submitted for approval. Any coal to be left unmined must be approved by BLM prior to abandoning the area.
4. Revise planned recovery of coal remnants in mains and sub-mains. Genwal plans retreat recovery of some pillars and barriers remaining in main entries and sub-main entries and updates timing and sequencing of this recovery.

The BLM has reviewed and analyzed the proposed revisions. Starting with the proposed longwall panels # 20 and # 21, we agree with the plan. When Genwal had earlier completed longwall panel # 19 and had developed Main East directly north of panel # 19, the BLM had given verbal approval to develop 3 ¼ East (a three entry development set) into this low coal block that was previously planned for room and pillar mining if coal heights were high enough. Subsequent quarterly inspections (June 29 and September 14, 2004) confirm coal heights above 5 feet thick and in the range of the new low-seam longwall equipment. Though the apparent and projected coal heights are near the minimum limits for operating the longwall equipment, the BLM encourages full recovery.

The area north of Main West and east of old longwall panel # 2 is also approved with similar conditions as in area one. This area was not previously scheduled for mining as the back end of old panel # 2 stopped due to coal below 6 feet which was the limits of the previous longwall machinery. With the acquisition of a low-seam continuous miner and longwall equipment, BLM gave verbal approval to connect up the Main West entries with the back end bleeder entries of old longwall panel # 2 (now called 3<sup>rd</sup> North off Main West) and then drive development entries east (called 1<sup>st</sup> Right Gate off of 3<sup>rd</sup> North) to ascertain coal heights for a low-seam longwall panel. In addition, Genwal applied for a lease modification for the east end of lease UTU-68082 to acquire unleased coal (if it exists with minable thickness) between the boundary and the outcrop to Huntington Canyon. An inspection on September 14, 2004, verified that the beginnings of 1<sup>st</sup> Right Gate had thicknesses of greater than 5 feet. We agree with the proposal and also the general plan to develop north of this proposed panel # 22 to recover minable coal with the new low-seam mining equipment. The requirements for the R2P2 for this lease modification area are met with your submission. However, Genwal is not authorized to mine in the lease modification area (west quarter of section 32, township 15 south, range 7 east) until a permit under the Surface Mining Control and Reclamation Act (administered by Utah Division of Oil Gas and Mining) is issued. This letter will be copied to Utah Division of Oil Gas and Mining (UDOGM) and will serve as our concurrence to them for requirements under the Mineral Leasing Act.

The fourth part of the proposed revisions depicts new sequencing and timing of mining remnant pillars left in the mains and sub-mains as part of final retreat mining. We agree and find the plan for recovering pillars in the mains and sub-mains a good attempt to recover remnant coal surrounded by mined out areas. We note that no retreat mining of Main West inby crosscut 116 is depicted on the latest submission. Genwal informed the BLM in late October, 2004, that they were planning to seal Main West due to adverse loading and the inability to maintain passage back to the end of Main West. BLM inspected the area on November 4, 2004, and noted the conditions. Heavy pillar loading was noted from crosscut 125 all the way back to near the end of Main West. Two large intersection caves were noted and heavy rib sloughage on the intake entry for most of this length. In addition, the rib line to the north barrier was pushing out coal well into the entry. It is apparent that pillar recovery will not be possible. First, before any additional mining can occur, all entries must be made travelable which will require all caves and failures clean up and secured. The depth for most of Main West is over 1500 feet with the middle area (where the worst conditions were noted) is over 2000 feet deep. Main West perform its function of

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longwall gob return air courses for the life of the north and south longwall block near Joe's Valley fault but cannot be used for final pillar recovery. We agree that the pillars in Main West inby crosscut 116 cannot be recovered safely or practically. We also concur with sealing the area as the coal is not recoverable, return ventilation is no longer needed and equipment and any hazardous materials have been removed.

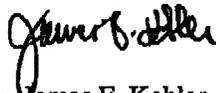
Our approval for these revisions to the R2P2 is conditioned on Genwal updating the recoverable reserve base for the Federal leases at the Crandall Canyon Mine within 30 days. Should extra time be necessary to finalize these numbers, please inform us at the contacts listed below. This is not a punitive measure, just an acknowledgement that reserve figures were not tracked in the past by all concerned. We wish to rectify recoverable reserves for all leases and lessees.

This approval of a minor modification to an existing R2P2 is Categorically Excluded from National Environmental Policy Act (NEPA) analysis in that no new surface disturbance will occur from this action as stated in Overview of BLM's NEPA Process, February 1997, Appendix 2, page 2-7 (F)(7). NEPA analysis was conducted for the lease modification area, and a Finding of No Significant Impact (FONSI) was signed in November 2004.

Genwal's proposed changes to the R2P2 complies with the Mineral Leasing Act of 1920, as amended, the regulations at 43 CFR 3480, the lease terms and conditions, and will achieve maximum economic recovery of the Federal coal. The mining plans as depicted on the October 12, 2004 submission (ACAD REF: R2P2 CRANDALL) is approved as submitted with the mentioned condition for reserves update. A copy of the approved mine map is enclosed. This approval constitutes our concurrence for R2P2 requirements for UDOGM on the area of the lease modification.

If you have any questions, please contact Stephen Falk in Price at (435) 636-3605 or Jeff McKenzie of my staff at (801) 539-4038.

Sincerely,



James F. Kohler  
Chief, Solid Minerals Branch

Enclosure  
Approved Mine Map

cc: Price Field Office (w/encl.)

Utah Division of Oil Gas and Mining (w/encl)  
1594 West North Temple, Suite 1210  
Salt Lake City, Utah 84114-5801

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FEB 28 2005  
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APPENDIX 5-25

SUBSIDENCE SURVEY LETTERS OF NOTIFICATION

INCORPORATED

APR 15 2005

DIV OF OIL GAS & MINERALS



P.O. BOX 1077  
PRICE, UTAH 84501  
PHONE: (435) 564-4000  
FAX: (435) 564-4002

May 18, 2004

Castle Valley Special Service District  
86 S 100 E  
Castledale, UT 84513

**Re: Subsidence Survey Notification, Crandall Canyon Mine, C/015/0032**

Dear Sirs:

GENWAL Resources, Inc. has conducted a subsidence survey at its Crandall Canyon and South Crandall Mines under Permit C/015/0032 filed with the Division of Oil, Gas and Mining in Salt Lake City, Utah. The survey has shown that you have surface rights and water rights within the possible subsidence zone of the approved mine plans in the permit.

This notice is in accordance with regulation R645-301-525.700, which is enforced by the Division of Oil, Gas and Mining.

Call me at 435-564-4015 if you have any questions.

Sincerely

A handwritten signature in black ink, appearing to read "G. E. Gray", written in a cursive style.

Gary E. Gray  
Agent/Engineer

INC.

APR 15 2005

DIV OF OIL GAS & MINING



P.O. BOX 1077  
PRICE, UTAH 84501  
PHONE: (435) 564-4000  
FAX: (435) 564-4002

May 18, 2004

National Forest Service  
Manti LaSal National Forest  
599 West Price River Road  
Price, UT 84501

**Re: Subsidence Survey Notification, Crandall Canyon Mine, C/015/0032**

Dear Sirs:

GENWAL Resources, Inc. has conducted a subsidence survey at its Crandall Canyon and South Crandall Mines under Permit C/015/0032 filed with the Division of Oil, Gas and Mining in Salt Lake City, Utah. The survey has shown that you have surface rights and water rights within the possible subsidence zone of the approved mine plans in the permit.

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Sincerely

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Gary E. Gray  
Agent/Engineer

INCORPORATED

APR 15 2005

DIV OF OIL GAS & MINING



P.O. BOX 1077  
PRICE, UTAH 84501  
PHONE: (435) 564-4000  
FAX: (435) 564-4002

May 18, 2004

SITLA  
675 east 500 South, Suite 500  
Salt Lake City, UT 84102

**Re: Subsidence Survey Notification, Crandall Canyon Mine, C/015/0032**

Dear Sirs:

GENWAL Resources, Inc. has conducted a subsidence survey at its Crandall Canyon and South Crandall Mines under Permit C/015/0032 filed with the Division of Oil, Gas and Mining in Salt Lake City, Utah. The survey has shown that you have surface rights and water rights within the possible subsidence zone of the approved mine plans in the permit.

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Call me at 435-564-4015 if you have any questions.

Sincerely

A handwritten signature in black ink, appearing to read 'G. E. Gray', written over a white background.

Gary E. Gray  
Agent/Engineer

INCORPORATED

APR 15 2005

DIV OF OIL GAS & MINING



P.O. BOX 1077  
PRICE, UTAH 84501  
PHONE: (435) 564-4000  
FAX: (435) 564-4002

May 18, 2004

Huntington-Cleveland Irrigation Company  
71 North Main  
Huntington, UT 84528

**Re: Subsidence Survey Notification, Crandall Canyon Mine, C/015/0032**

Dear Sirs:

GENWAL Resources, Inc. has conducted a subsidence survey at its Crandall Canyon and South Crandall Mines under Permit C/015/0032 filed with the Division of Oil, Gas and Mining in Salt Lake City, Utah. The survey has shown that you have surface rights and water rights within the possible subsidence zone of the approved mine plans in the permit.

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Call me at 435-564-4015 if you have any questions.

Sincerely

A handwritten signature in black ink, appearing to read "Gary E. Gray", written in a cursive style.

Gary E. Gray  
Agent/Engineer

INCORPORATED  
APR 15 2005  
DIV OF OIL GAS & MINING



P.O. Box 1077, Price, Utah 84501 794 North "C" Canyon Rd, East Carbon, Utah 84520  
Telephone (435) 888-4000 Fax (435) 888-4002

April 27, 2005

Alice Carlson  
Forest Supervisor  
Manti-LaSal National Forest  
599 West Price River Dr.  
Price, Utah 84501

Dear Ms. Carlson:

GENWAL Resources, Inc. presently holds a Forest Service special use permit for a trailhead parking lot at the Crandall Canyon Mine (copy attached). We hereby request to amend this special use permit to allow GENWAL to utilize part of this trailhead for employee parking as shown on the accompanying drawing. Under this proposal, the outer 20' wide perimeter of the trailhead would continue to be used for public parking associated with usage of the trail. This would accommodate up to five vehicle/horse-trailer combinations, with ample room for run-around. Vehicles could exit the trailhead through a permanent break in the material storage yard which would allow unrestricted egress from the parking lot. GENWAL also seeks permission to excavate a small part of the existing bank near the upper end of the trailhead (see drawing) to allow increased utilization of the parking area.

We appreciate your consideration of this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "David Shaver", written in a cursive style.

David Shaver  
Manager of Technical Services

**INCORPORATED**

**JUL 28 2005**

**DIV OF OIL GAS & MINING**

Authorization ID: PRI42  
Contact ID: GENWAL  
Expiration Date: 12/31/2022  
Use Code: 522

FS-2700-4 (8/99)  
OMB 0596-0082

**U.S. DEPARTMENT OF AGRICULTURE**  
**Forest Service**  
**SPECIAL USE PERMIT**  
**AUTHORITY:**  
**ORGANIC ADMINISTRATION ACT June 4, 1897**

GENWAL RESOURCES, INCORPORATED of P.O. BOX 1077, PRICE, UT 84501 (hereinafter called the Holder) is hereby authorized to use or occupy National Forest System lands, to use subject to the conditions set out below, on the Manti-La Sal National Forest, Price Ranger District.

This permit covers .1 acres, and/or 0 miles and is described as: Sec. 6, T16S, R7E, SALT LAKE as shown on the location map attached to and made a part of this permit, and is issued for the purpose of:

Snow storage and summer parking. Permittee will be responsible for noxious weed control on the permitted area.

The above described or defined area shall be referred to herein as the "permit area".

**TERMS AND CONDITIONS**

**I. AUTHORITY AND GENERAL TERMS OF THE PERMIT**

A. Authority. This permit is issued pursuant to the authorities enumerated at Title 36, Code of Federal Regulations, Section 251 Subpart B, as amended. This permit, and the activities or use authorized, shall be subject to the terms and conditions of the Secretary's regulations and any subsequent amendment to them.

B. Authorized Officer. The authorized officer is the Forest Supervisor or a delegated subordinate officer.

C. License. This permit is a license for the use of federally owned land and does not grant any permanent, possessory interest in real property, nor shall this permit constitute a contract for purposes of the Contract Disputes Act of 1978 (41 U.S.C. 611). Loss of the privileges granted by this permit by revocation, termination, or suspension is not compensable to the holder.

D. Amendment. This permit may be amended in whole or in part by the Forest Service when, at the discretion of the authorized officer, such action is deemed necessary or desirable to incorporate new terms, conditions, and stipulations as may be required by law, regulation, land management plans, or other management decisions.

E. Existing Rights. This permit is subject to all valid rights and claims of third parties. The United States is not liable to the holder for the exercise of any such right or claim.

F. Nonexclusive Use and Public Access. Unless expressly provided for in additional terms, use of the permit area is not exclusive. The Forest Service reserves the right to use or allow others to use any part of the permit area, including roads, for any purpose, provided, such use does not materially interfere with the holder's authorized use. A final determination of conflicting uses is reserved to the Forest Service.

G. Forest Service Right of Entry and Inspection. The Forest Service has the right of unrestricted access of the permitted area or facility to ensure compliance with laws, regulations, and ordinances and the terms and conditions of this permit.

H. Assignability. This permit is not assignable or transferable. If the holder through death, voluntary sale, or transfer, enforcement of contract, foreclosure, or other valid legal proceeding ceases to be the owner of the improvements, this permit shall terminate.

INCORPORATED  
JUL 28 2005  
DIV OF OIL GAS & MINING

I. Permit Limitations. Nothing in this permit allows or implies permission to build or maintain any structure or facility, or to conduct any activity unless specifically provided for in this permit. Any use not specifically identified in this permit must be approved by the authorized officer in the form of a new permit or permit amendment.

## II. TENURE AND ISSUANCE OF A NEW PERMIT

A. Expiration at the End of the Authorized Period. This permit will expire at midnight on **12/31/2022**. Expiration shall occur by operation of law and shall not require notice, any decision document, or any environmental analysis or other documentation.

B. Minimum Use or Occupancy of the Permit Area. Use or occupancy of the permit area shall be exercised at least 365 days each year, unless otherwise authorized in writing under additional terms of this permit.

C. Notification to Authorized Officer. If the holder desires issuance of a new permit after expiration, the holder shall notify the authorized officer in writing not less than six (6) months prior to the expiration date of this permit.

D. Conditions for Issuance of a New Permit. At the expiration or termination of an existing permit, a new permit may be issued to the holder of the previous permit or to a new holder subject to the following conditions:

1. The authorized use is compatible with the land use allocation in the Forest Land and Resource Management Plan.
2. The permit area is being used for the purposes previously authorized.
3. The permit area is being operated and maintained in accordance with the provisions of the permit.
4. The holder has shown previous good faith compliance with the terms and conditions of all prior or other existing permits, and has not engaged in any activity or transaction contrary to Federal contracts, permits laws, or regulations.

E. Discretion of Forest Service. Notwithstanding any provisions of any prior or other permit, the authorized officer may prescribe new terms, conditions, and stipulations when a new permit is issued. The decision whether to issue a new permit to a holder or successor in interest is at the absolute discretion of the Forest Service.

F. Construction. Any construction authorized by this permit may commence by N/A and shall be completed by N/A. If construction is not completed within the prescribed time, this permit may be revoked or suspended.

## III. RESPONSIBILITIES OF THE HOLDER

A. Compliance with Laws, Regulations, and other Legal Requirements. The holder shall comply with all applicable Federal, State, and local laws, regulations, and standards, including but not limited to, the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., the Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq., the Comprehensive Environmental Response, Control, and Liability Act, 42 U.S.C. 9601 et seq., and other relevant environmental laws, as well as public health and safety laws and other laws relating to the siting, construction, operation, and maintenance of any facility, improvement, or equipment on the property.

B. Plans. Plans for development, layout, construction, reconstruction, or alteration of improvements on the permit area, as well as revisions of such plans, must be prepared by a qualified individual acceptable to the authorized officer and shall be approved in writing prior to commencement of work. The holder may be required to furnish as-built plans, maps, or surveys, or other similar information, upon completion of construction.

C. Maintenance. The holder shall maintain the improvements and permit area to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the authorized officer and consistent with other provisions of this authorization. If requested, the holder shall comply with inspection requirements deemed appropriate by the authorized officer.

D. Hazard Analysis. The holder has a continuing responsibility to identify all hazardous conditions on the permit area which would affect the improvements, resources, or pose a risk of injury to individuals. Any non-emergency actions to abate such hazards shall be performed after consultation with the authorized officer. In emergency situations, the holder shall notify the authorized officer of its actions as soon as possible, but not more than 48 hours, after such actions have been taken.

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JUL 20 2005

E. Change of Address. The holder shall immediately notify the authorized officer of a change in address.

F. Change in Ownership. This permit is not assignable and terminates upon change of ownership of the improvements or control of the business entity. The holder shall immediately notify the authorized officer when a change in ownership or control of business entity is pending. Notification by the present holder and potential owner shall be executed using Form SF-299 Application for Transportation and Utility Systems and Facilities of Federal Lands, or Form FS-2700-3a, Holder Initiated Revocation of Existing Authorization, Request for a Special Use Permit. Upon receipt of the proper documentation, the authorized officer may issue a permit to the party who acquires ownership of, or a controlling interest in, the improvements or business entity.

#### IV. LIABILITY

For purposes of this section, "holder" includes the holder's heirs, assigns, agents, employees, and contractors.

A. The holder assumes all risk of loss to the authorized improvements.

B. The holder shall indemnify, defend, and hold the United States harmless for any violations incurred under any such laws and regulations or for judgments, claims, or demands assessed against the United States in connection with the holder's use or occupancy of the property. The holder's indemnification of the United States shall include any loss by personal injury, loss of life or damage to property in connection with the occupancy or use of the property during the term of this permit. Indemnification shall include, but is not limited to, the value of resources damaged or destroyed; the costs of restoration, cleanup, or other mitigation; fire suppression or other types of abatement costs; third party claims and judgments; and all administrative, interest, and other legal costs. This paragraph shall survive the termination or revocation of this authorization, regardless of cause.

C. The holder has an affirmative duty to protect from damage the land, property, and interests of the United States.

D. In the event of any breach of the conditions of this authorization by the holder, the authorized officer may, on reasonable notice, cure the breach for the account at the expense of the holder. If the Forest Service at any time pays any sum of money or does any act which will require payment of money, or incurs any expense, including reasonable attorney's fees, in instituting, prosecuting, and/or defending any action or proceeding to enforce the United States rights hereunder, the sum or sums so paid by the United States, with all interests, costs and damages shall, at the election of the Forest Service, be deemed to be additional fees hereunder and shall be due from the holder to the Forest Service on the first day of the month following such election.

E. With respect to roads, the holder shall be proportionally liable for damages to all roads and trails of the United States open to public use caused by the holder's use to the same extent as provided above, except that liability shall not include reasonable and ordinary wear and tear.

F. The Forest Service has no duty to inspect the permit area or to warn of hazards and, if the Forest Service does inspect the permit area, it shall incur no additional duty nor liability for identified or non-identified hazards. This covenant may be enforced by the United States in a court of competent jurisdiction.

#### V. TERMINATION, REVOCATION, AND SUSPENSION

A. General. For purposes of this permit, "termination", "revocation", and "suspension" refer to the cessation of uses and privileges under the permit.

"Termination" refers to the cessation of the permit under its own terms without the necessity for any decision or action by the authorized officer. Termination occurs automatically when, by the terms of the permit, a fixed or agreed upon condition, event, or time occurs. For example, the permit terminates at expiration. Terminations are not appealable.

"Revocation" refers to an action by the authorized officer to end the permit because of noncompliance with any of the prescribed terms, or for reasons in the public interest. Revocations are appealable.

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DIV OF OIL GAS & MINING

"Suspension" refers to a revocation which is temporary and the privileges may be restored upon the occurrence of prescribed actions or conditions. Suspensions are appealable.

B. Revocation or Suspension. The Forest Service may suspend or revoke this permit in whole or part for:

1. Noncompliance with Federal, State, or local laws and regulations.
2. Noncompliance with the terms and conditions of this permit.
3. Reasons in the public interest.
4. Abandonment or other failure of the holder to otherwise exercise the privileges granted.

C. Opportunity to Take Corrective Action. Prior to revocation or suspension for cause pursuant to Section V (B), the authorized officer shall give the holder written notice of the grounds for each action and a reasonable time, not to exceed 90 days, to complete the corrective action prescribed by the authorized officer.

D. Removal of Improvements. Prior to abandonment of the improvements or within a reasonable time following revocation or termination of this authorization, the holder shall prepare, for approval by the authorized officer, an abandonment plan for the permit area. The abandonment plan shall address removal of improvements and restoration of the permit area and prescribed time frames for these actions. If the holder fails to remove the improvements or restore the site within the prescribed time period, they become the property of the United States and may be sold, destroyed or otherwise disposed of without any liability to the United States. However, the holder shall remain liable for all cost associated with their removal, including costs of sale and impoundment, cleanup, and restoration of the site.

## VI. FEES

A. Termination for Nonpayment. This permit shall automatically terminate without the necessity of prior notice when land use rental fees are 90 calendar days from the due date in arrears.

B. The holder shall pay One Hundred Eighty Dollars \$180.00 for the period from January 1, 2004, to December 31, 2007, and thereafter at the beginning of each 5-year period a lump sum payment for 5 years rent of Two Hundred Twenty Five Dollars \$225.00: Provided, charges for this use shall be made or readjusted whenever necessary to place the charges on a basis commensurate with the fair market value of the authorized use.

C. Payment Due Date. The payment due date shall be the close of business on January 1st of each calendar year payment is due. Payments due the United States for this use shall be deposited at USDA Forest Service, File 71652, P.O. Box 60000, San Francisco, CA 94160-1652, in the form of a check, draft, or money order payable to "Forest Service, USDA." Payments shall be credited on the date received by the designated Forest Service collection officer or deposit location. If the due date for the fee or fee calculation statement falls on a non-workday, the charges shall not apply until the close of business on the next workday.

D. Late Payment Interest, Administrative Costs and Penalties Pursuant to 31 U.S.C. 3717, et seq., interest shall be charged on any fee amount not paid within 30 days from the date the fee or fee calculation financial statement specified in this authorization becomes due. The rate of interest assessed shall be the higher of the rate of the current value of funds to the U.S. Treasury (i.e., Treasury tax and loan account rate), as prescribed and published by the Secretary of the Treasury in the Federal Register and the Treasury Fiscal Requirements Manual Bulletins annually or quarterly or at the Prompt Payment Act rate. Interest on the principal shall accrue from the date the fee or fee calculation financial statement is due.

In the event the account becomes delinquent, administrative costs to cover processing and handling of the delinquency will be assessed.

A penalty of 6 percent per annum shall be assessed on the total amount delinquent in excess of 90 days and shall accrue from the same date on which interest charges begin to accrue.

Payments will be credited on the date received by the designated collection officer or deposit location. If the due date for the fee or fee calculation statement falls on a non-workday, the charges shall not apply until the close of business on the next workday.

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Disputed fees are due and payable by the due date. No appeal of fees will be considered by the Forest Service without full payment of the disputed amount. Adjustments, if necessary, will be made in accordance with settlement terms or the appeal decision.

If the fees become delinquent, the Forest Service will:

Liquidate any security or collateral provided by the authorization.

If no security or collateral is provided, the authorization will terminate and the holder will be responsible for delinquent fees as well as any other costs of restoring the site to its original condition including hazardous waste cleanup.

Upon termination or revocation of the authorization, delinquent fees and other charges associated with the authorization will be subject to all rights and remedies afforded the United States pursuant to 31 U.S.C. 3711 *et seq.* Delinquencies may be subject to any or all of the following conditions:

Administrative offset of payments due the holder from the Forest Service.

Delinquencies in excess of 60 days shall be referred to United States Department of Treasury for appropriate collection action as provided by 31 U.S.C. 3711 (g), (1).

The Secretary of the Treasury may offset an amount due the debtor for any delinquency as provided by 31 U.S.C. 3720, *et seq.*)

## VII. OTHER PROVISIONS

A. Members of Congress. No Member of or Delegate to Congress or Resident Commissioner shall benefit from this permit either directly or indirectly, except when the authorized use provides a general benefit to a corporation.

B. Appeals and Remedies. Any discretionary decisions or determinations by the authorized officer are subject to the appeal regulations at 36 CFR 251, Subpart C, or revisions thereto.

C. Superior Clauses. In the event of any conflict between any of the preceding printed clauses or any provision thereof and any of the following clauses or any provision thereof, the preceding printed clauses shall control.

D. Nondiscrimination in Employment and Services (B1). During the performance of this authorization, the holder agrees:

1. In connection with the performance of work under this authorization, including construction, maintenance, and operation of the facility, the holder shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, or disability. (Ref. Title VII of the Civil Rights Act of 1964, as amended).

2. The holder and employees shall not discriminate by segregation or otherwise against any person on the basis of race, color, religion, sex, national origin, age, or disability, by curtailing or refusing to furnish accommodations, facilities, services, or use privileges offered to the public generally. (Ref. Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; Title IX of the Education Amendments, and the Age Discrimination Act of 1975).

3. The holder shall include and require compliance with the above nondiscrimination provisions in any subcontract made with respect to the operations under this authorization.

4. When furnished by the Forest Service, signs setting forth this policy of nondiscrimination will be conspicuously displayed at the public entrance to the premises, and at other exterior or interior locations as directed by the Forest Service.

5. The Forest Service shall have the right to enforce the foregoing nondiscrimination provisions by suit for specific performance or by any other available remedy under the laws of the United States of the State in which the breach or violation occurs.

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E. Operating Plan (C8). The holder shall provide an Operating Plan. The plan shall be prepared in consultation with the authorized officer or designated representative and cover operation and maintenance of facilities, dates or season of operations, and other information required by the authorized officer to manage and evaluate the occupation and/or use of National Forest System lands. The provisions of the Operating Plan and the annual revisions shall become a part of this authorization and shall be submitted by the holder and approved by the authorized officer or their designated representative(s). This Operating Plan is hereby made a part of the authorization.

F. Removal and Planting of Vegetation and Other Resources (D5). The holder shall obtain prior written approval from the authorized officer before removing or altering vegetation or other resources. The holder shall obtain prior written approval from the authorized officer before planting trees, shrubs, or other vegetation within the authorized area.

G. Revegetation of Ground Cover and Surface Restoration (D9). The holder shall be responsible for prevention and control of soil erosion and gulying on lands covered by this authorization and adjacent thereto, resulting from construction, operation, maintenance, and termination of the authorized use. The holder shall so construct permitted improvements to avoid the accumulation of excessive heads of water and to avoid encroachment on streams. The holder shall revegetate or otherwise stabilize all ground where the soil has been exposed as a result of the holder's construction, maintenance, operation, or termination of the authorized use and shall construct and maintain necessary preventive measures to supplement the vegetation.

H. Pesticide Use (D23). Pesticides may not be used to control undesirable woody and herbaceous vegetation, aquatic plants, insects, rodents, trash fish, etc., without the prior written approval of the Forest Service. A request for approval of planned uses of pesticides will be submitted annually by the holder on the due date established by the authorized officer. The report will cover a 12-month period of planned use beginning 3 months after the reporting date. Information essential for review will be provided in the form specified. Exceptions to this schedule may be allowed, subject to emergency request and approval, only when unexpected outbreaks of pests require control measures which were not anticipated at the time an annual report was submitted.

I. Superseded Authorization (X18). This authorization supersedes a special-use authorization designated: PRI409002, dated 8/13/87 for snow storage and summer parking, termination date 12/31/02.

J. Corporation Status Notification (X46). The holder shall furnish the authorized officer with the names and addresses of shareholders owning three (3) percent or more of the shares, and number and percentage of any class of voting shares of the entity which such shareholder is authorized to vote. In addition, the holder shall notify the authorized officer within fifteen (15) days of the following changes:

1. Names of officers appointed or terminated.
2. Names of stockholders who acquire stock shares causing their ownership to exceed 50 percent of shares issued or who otherwise acquire controlling interest in the corporation.
3. A copy of the articles of incorporation and bylaws.
4. An authenticated copy of a resolution of the board of directors specifically authorizing a certain individual or individuals to represent the holder in dealing with the Forest Service.
5. A list of officers and directors of the corporation and their addresses.
6. Upon request, a certified list of stockholders and amount of stock owned by each.
7. The authorized officer may, when necessary, require the holder to furnish additional information as set forth in 36 CFR 251.54 (e)(1)(iv).

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According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0082.

This information is needed by the Forest Service to evaluate requests to use National Forest System lands and manage those lands to protect natural resources, administer the use, and ensure public health and safety. This information is required to obtain or retain a benefit. The authority for that requirement is provided by the Organic Act of 1897 and the Federal Land Policy and Management Act of 1976, which authorize the Secretary of Agriculture to promulgate rules and regulations for authorizing and managing National Forest System lands. These statutes, along with the Term Permit Act, National Forest Ski Area Permit Act, Granger-Thye Act, Mineral Leasing Act, Alaska Term Permit Act, Act of September 3, 1954, Wilderness Act, National Forest Roads and Trails Act, Act of November 16, 1973, Archaeological Resources Protection Act, and Alaska National Interest Lands Conservation Act, authorize the Secretary of Agriculture to issue authorizations for the use and occupancy of National Forest System lands. The Secretary of Agriculture's regulations at 36 CFR Part 251, Subpart B, establish procedures for issuing those authorizations.

The Privacy Act of 1974 (5 U.S.C. 552a) and the Freedom of Information Act (5 U.S.C. 552) govern the confidentiality to be provided for information received by the Forest Service. Public reporting burden for collection of information, if requested, is estimated to average 1 hour per response for annual financial information; average 1 hour per response to prepare or update operation and/or maintenance plan; average 1 hour per response for inspection reports; and an average of 1 hour for each request that may include such things as reports, logs, facility and user information, sublease information, and other similar miscellaneous information requests. This includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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This permit is accepted subject to the conditions set out above.

Date 6/9/03 GENWAL RESOURCES, INC.

(CORPORATE SEAL)

By: Samuel C. Dindley  
(Vice) President Operations

ATTEST: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Assistant) Secretary

The following certificate shall be executed by the Secretary or Assistant Secretary of the Corporation:

I, \_\_\_\_\_ certify that I am the \_\_\_\_\_ Secretary of the Corporation that executed the above permit; that \_\_\_\_\_ who signed said permit on behalf of said Corporation was then \_\_\_\_\_ of said Corporation; that I know his/her signature on said permit is genuine; and that said permit was duly signed, sealed, and attested to for and on behalf of said Corporation by authority of its governing body

(CORPORATE SEAL)

\_\_\_\_\_  
(Assistant Secretary)

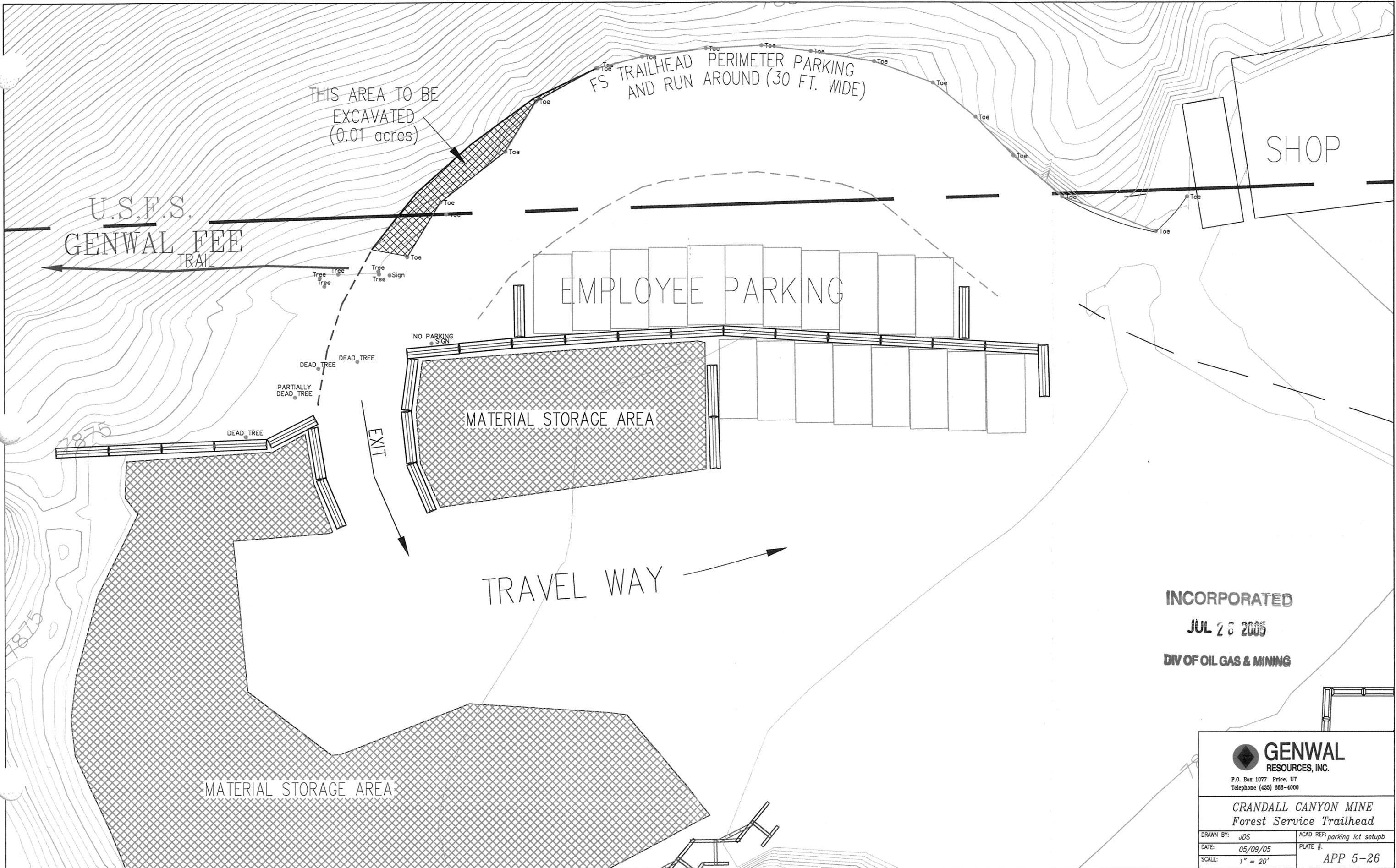
**U. S. DEPARTMENT OF AGRICULTURE**  
Forest Service

By: Anna L. H...  
(Authorized Officer Signature)

*for* Elaine J. Zieroth, Forest Supervisor  
(Name and Title)

6/10/2003  
(Date)

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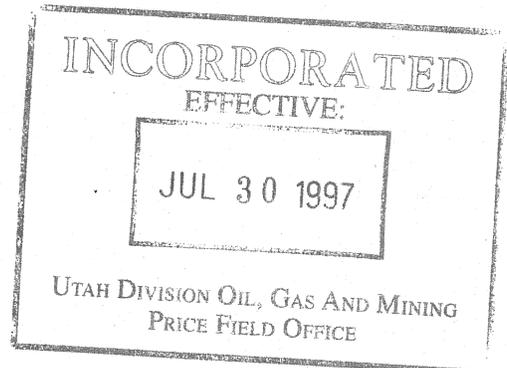
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<small>P.O. Box 1077 Price, UT          Telephone (435) 888-4000</small>	
<b>CRANDALL CANYON MINE</b> <i>Forest Service Trailhead</i>	
<small>DRAWN BY: JDS</small>	<small>ACAD REF: parking lot setup</small>
<small>DATE: 05/09/05</small>	<small>PLATE #:</small>
<small>SCALE: 1" = 20'</small>	<small>APP 5-26</small>

**CHAPTER 6**

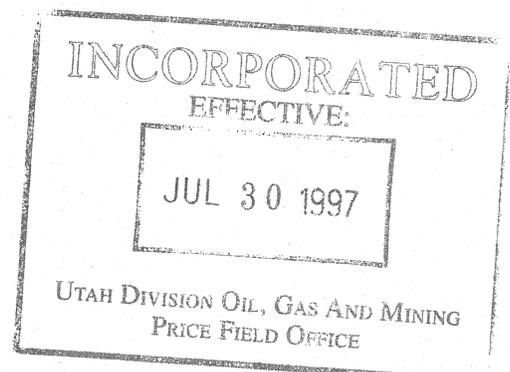
**GEOLOGY  
(R645-301-600)**

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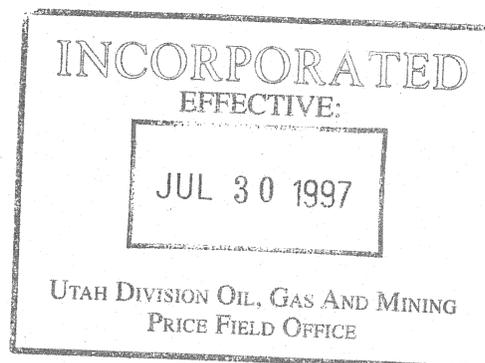
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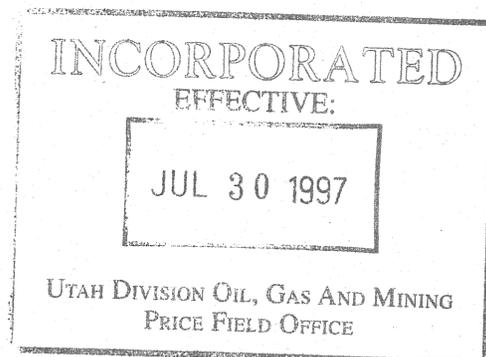
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APPENDIX 6-7	Generalized Geologic Cross-Section, South Crandall Lease Area

Note: Bold number plates and appendices are included with this submittal.

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**Chapter 6**  
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**GEOLOGY**

**6.10 Introduction**

This Chapter presents discussion of geologic conditions within and adjacent to the Genwal Mine Permit Area, which consists of Lease Areas SL062648 and U054762, State Lease ML-21569, State Lease ML-21568, Federal Lease UTU-68082 (including the lease modification), Federal Lease UTU-78953, the SITLA/PacifiCorp sublease and the Nielson Fee Lease. Conclusions herein are based on field reconnaissance, exploratory drilling and previous documentation. Report references are shown at the end of this chapter.

**6.11 General Requirements**

The geology within and adjacent to the permit area is discussed in Sections 6.21 through 6.27 of this chapter. Plans for casing and sealing of exploration holes and for subsidence monitoring are discussed in Sections 6.30 through 6.32.

**6.12 Certification**

All required maps, plans and cross-sections presented in this chapter have been certified by a registered professional engineer.

**6.20 Environmental Description**

This section presents a description of the geologic resources in, and adjacent to the permit area.

**6.21 General Requirements**

**Regional Geology**

The Wasatch Plateau consists of Tertiary and Cretaceous strata, mostly limestone, sandstone, and shale that differ in resistance to erosion (Davis and Doelling, 1977). Limestones and sandstones generally form cliffs, whereas the shales form recessive slopes.

Stratigraphic units present in the vicinity of the Crandall Canyon area include from youngest to oldest (1) the North Horn Formation (slope-forming mudstone and sandstone). (2) the Price River Formation which consists of the basal Castlegate Sandstone Member (cliff-forming sandstones, conglomerates and minor amounts of shale, of deltaic origin) and the Upper Price River Member (steep slope-forming sandstone with minor interbeds of pebble conglomerate and shale, of fluvial origin). (3) the Blackhawk Formation (cliff-forming sandstone underlain by slope-forming mudstone, shale and coal, of paludal origin). (4) the Star Point Sandstone (cliff-forming sandstones consisting of deltaic and beach deposits), and (5) the Masuk Shale Member of the Mancos Shale

mudstone, shale and coal, of paludal origin). (4) the Star Point Sandstone (cliff-forming sandstones consisting of deltaic and beach deposits), and (5) the Masuk Shale Member of the Mancos Shale (slope-forming marine shales), refer to Appendix 6-3 and 6-4 and Plate 6-1. The Star Point Sandstone contains several shale tongues of the underlying Masuk Shale in the Wasatch Plateau region.

The stratigraphic record produced by these units indicates that deposition up through the Blackhawk Formation consisted mostly of fine-grained detritus under conditions of relatively quiet and uniform sedimentation (Davis and Doelling, 1977). An erosional disconformity exists at the top of the Blackhawk Formation, which is overlain by coarse clastics of the Castlegate Sandstone. These coarse continental sediments suggest tectonic movement to the west and probably mark the onset of the Laramide orogeny (Davis and Doelling, 1977).

The Wasatch Plateau lies in a transition zone between the relatively stable Colorado Plateau to the east and the relatively complex and unstable Basin and Range province to the west (Davis and Doelling, 1977). Strata of the western Wasatch Plateau dip into a complexly faulted monocline, whereas strata on the east side have predominantly gentle dips and faults are less numerous (Davis and Doelling, 1977).

Major faults present within the region of the coal fields are north-trending with maximum displacements of up to 2,300 feet (Davis and Doelling, 1977). Many north-trending faults with minor displacements are present and few east-trending faults, most of which have displacements of less than 100 feet, are also present locally.

Most of the strata in the coal field form broad anticlines and synclines that trend northeast or are roughly perpendicular to the principal fault zones (Davis and Doelling, 1977).

### **Geology of Project Vicinity**

The drainage basins of Crandall Blind and Horse Canyons cover approximately 5.7, 2.0 and 7.0 square miles respectively and expose six geologic units which range in age from Cretaceous to Tertiary. Surface lands within the permit area consist entirely of outcrop exposures of sandstones, mudstones and coal of the Castlegate Sandstone, Blackhawk Formation, Star Point Sandstone, Price River Formation, and North Horn Formation and are shown on Plate 6-1.

The Hiawatha and Blind Canyon coal seams, which will be of importance in the permit area are present at or near the base of the Blackhawk Formation (Campanian in age). Several other thin lenticular coal seams are present at the property, but none are of significant thickness or of probable lateral extent to be of economic interest. In much of the permit area, including the U-68082 lease mod area, only the Hiawatha seam is of sufficient thickness to be economically recoverable. However, in the South Crandall lease area both seams are mineable.

The Hiawatha coal seam has been mined and is exposed at an approximate elevation of 7,900 feet amsl (Appendix 6-1). Mining overburden above the Hiawatha coal seam in the permit area consists of the Blackhawk Formation, Castlegate Sandstone, and the Upper Price River Member and

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results in a maximum overburden of approximately 2,400 feet and an average overburden of approximately 1,100 feet. The entire area is underlain by the Star Point Sandstone.

The coal-bearing unit is the Upper Cretaceous Blackhawk Formation. The Blackhawk Formation is composed of grey sandstone, siltstone, shale, and coal; it is composed of about 50% fine-grained sandstone and is present in thicknesses of 650 to 1,000 feet at Crandall Canyon. The Hiawatha coal bed is the thickest coal bed present (10 feet at Crandall Canyon), and is found near the base of the Blackhawk (Lines, 1985).

The Upper Cretaceous Star Point Formation underlies the Blackhawk Formation. It is predominately composed of massive tan medium-grained sandstone with minor interbeds of shale and siltstone near its base. This formation outcrops east of the Crandall Canyon Mine and reaches a thickness of 350 to 450 feet. At the southeast end of Trail Mountain, where the Star Point is exposed, it is about 500 feet thick (Lines, 1985). This formation is of significance since it and the saturated portions of the Blackhawk Formation comprise a regional aquifer present at both mine sites.

The Upper Cretaceous Castlegate Formation overlies the Blackhawk Formation and is dominated by massive tan medium-grained massive sandstone. It has a thickness of about 170 to 200 feet at Trail Mountain, and is 250 feet thick at Crandall Canyon (Lines, 1985).

The Castlegate is overlain by the Upper Cretaceous Price River Formation, a grey medium - to coarse - grained sandstone interbedded with several thin shale beds at both mine sites. The Price River is about 700 feet thick at the Trail Mountain Mine (Lines, 1985), and is about 600 feet thick at the Crandall Canyon Mine.

Overlying the Castlegate is the North Horn Formation of Upper Cretaceous and Tertiary age. It is composed of interbedded shales, siltstone, sandstones, and limestones. At the Trail Mountain mine it reaches a thickness of about 1,000 feet, although thicknesses of only several hundred feet are present at Genwal, due to erosion. The North Horn Formation caps the mountain ridges in the area, and serves as a recharge unit to underlying formations and supplies water to springs within the formation.

The Joes Valley Fault breaks the continuity of these geologic units at both the Trail Mountain and Crandall Canyon Mines. The Joes Valley Fault lies along the west base of Trail Mountain, and along the west base of East Mountain at the Crandall Canyon Mine (Davis and Doelling, 1977). The Joes Valley Fault forms the eastern boundary of a graben about 3 miles wide which extends north and south of both mines (Davis and Doelling, 1977). Davis and Doelling (1977) estimate approximately 2300 feet of vertical displacement along the fault in this area. Stratigraphic dip at both mine sites is approximately 2 to 3 degrees to the southeast (Lines, 1985).

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As discussed in Section 5.25, mining-induced subsidence will not intersect the Joes Valley Fault. The maximum limit of subsidence in the permit area is depicted on Plates 5-2, 5-2B, and Figure 5-9, and subsidence-induced hydrologic effects are discussed in Section 7.0.

Geologic inspection of the property indicates that prior mining of the Hiawatha Seam did not encounter subsurface water. The maps submitted in Appendices 6-3 and 6-4 and Plate 6-1 are included to show the relative location of the geologic formations to the mine permit area.

## **6.22 Cross Sections, Maps and Plans**

Stratigraphic sections, best available BLM and Genwal data are shown in Appendices 6-1, 6-4 and 6-5. Drill hole results and cross sections are shown in Appendix 6-5. The Geologic map is on Plate 6-1. Coal seam isopachs for the Hiawatha, Blind Canyon and Bear Canyon Seams are shown on Plates (all applicable data) 6-3, 6-4 and 6-5, respectively. Overburden is shown on Plate 6-6. Structure is shown in Appendix 6-3. A structure contour map of the top of the Hiawatha seam is shown on Plate 6-7. Refer to Plates 5-2(H) and 5-2(BC) for information regarding the South Crandall lease area, and the U-68082 lease mod area including coal seam thickness, seam interval, overburden thickness, and drill hole locations. A generalized geologic cross-section is shown in Appendix 6-7.

### **6.22.1 Test Borings and Coal Sampling**

Genwal has included two lithologic, depth correlated sections to show thicknesses of interburden and coal from the Star Point Sandstone to the surface. These geologic sections are provided in Appendix 6-1 and Appendix 6-5. The lithofacies of the Blackhawk Formation in the vicinity of the mine area are shown in stratigraphic section within Appendix 6-1 and Appendix 6-5. Two additional holes have been drilled, MW-3 and MW-4 in State Section ML-21569. MW-4 was drilled and cored and is a water monitoring source (Appendix 6-5). MW-3 was drilled down but not cored. These sections should provide sufficient technical information to determine the nature, depth and thickness of the coal seams, rider seams, overburden and interburden strata for the permit area. The thickness and extent of all formations in the area adjacent to the mine area are shown on Plates 6-1 through 6-6, with related discussion in Section 6.21. Borehole locations are shown on Plate 5-2. The known locations of proposed in-mine up-drilled borings and surface bore holes are shown on Plate 5-2.

The drilling results obtained during 1985 indicate the presence of the Blind Canyon seam although it is of unminable thickness in the vicinity of the Crandall Canyon No. 1 Mine (Appendices 6-1 and 6-5). The upper seam will be called the Blind Canyon Seam at the request of DOGM to simplify discussion. The same seam has been referred to as the "upper Hiawatha Seam" and the "lower Bear Canyon Seam" at various other locations.

Analysis of coal samples collected from the Hiawatha Seam indicate that it is a high volatile

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bituminous coal with a BTU content ranging from 12,500 to 13,000 BTU, ash content of 6% to 8%, moisture of 3% to 5%, volatile matter from 40% to 44%, fixed carbon from 43% to 46% and sulfur from 0.44% to 0.55%. Forms of Sulfur average 0.016% pyritic sulfur, 0.09% sulfate sulfur, and 0.30% organic sulfur, Appendix 6-2. Locations of samples are at 1st Right Main West, 9th left 1st East, and 1st North 1st Right.

Within the South Crandall lease there is only one drill hole of geologic data, HC-4. This hole was drilled in 1981 and encountered 6'9" of coal in the Blind Canyon, and 5.0' in the Hiawatha, which is marginally mineable with low coal equipment. The coal analysis from this hole is: Blind Canyon 13352 BTU, 0.61% sulfur, 5.46% ash - Hiawatha: 13126 BTU, 0.56% sulfur, 6.3% ash. The location HC-4 is shown on Plates 5-2 (BC) and 5-2 (H).

### 6.22.2 Coal Seams, Overburden, Stratum Coal Seams

Additional technical information has been submitted to determine the nature, depth and thickness of the coal seams, rider seams, overburden and interburden strata for the permitted mine area based upon drilling completed to date (Appendices 6-1 and 6-5 and Plates 5-2). There is insufficient evidence to support the presence of the Blind Canyon Seam in Crandall Canyon, but it thickens southward to the Mill Fork area, beyond which it again is of little value (Doelling, 1972, p. 189). The old workings can provide information on the lower seam (Hiawatha) and some ground water information but nothing about the other seams. Additional geologic information was submitted by Mr. Wollen, a former operator of the Genwal property, which contained specific lithologic characterizations of the interburden, and the strata immediately above and below the coal seams (Appendices 6-1 and 6-2). Additional geologic information about the South Crandall lease area is found in Appendix 6-6.

**Coal Reserves** Coal-seam data for lease area SL 062648 indicates that approximately 840,000 tons of coal are in place, of which 400,000 tons are recoverable. Lease area U 54762 contains approximately 2.5 million tons of coal in place, of which approximately 1.5 million tons are recoverable. Approximately 0.5 million tons will be left in place for final retreat, leaving approximately one million tons minable during advance.

In-place tonnage for State Leases ML-215688 and ML-21569 is estimated at 18,000,000 tons, of which 8,000,000 tons are considered recoverable. The Lease #UTU-68082 has an estimated in-place tonnage of 36,000,000 tons, of which 12,000,000 tons are considered recoverable. In the South Crandall lease area the estimated recoverable reserves are 7.63 million tons. Due to the speculative nature of the U-68082 lease mod area no recoverable reserves are estimated.

All mining within the Crandall Canyon #1 Mine is within the Hiawatha seam. The Blind Canyon seam is present above the Crandall Canyon #1 Mine but is not thick enough to mine. (Coal seam isopachs for this area are shown on Plates 6-4 and 6-5) in the area of the South Crandall Mine (i.e., within the South Crandall lease area) both the Hiawatha and the Blind Canyon seams reach minable thickness. The approved R2P2 for the South Crandall Mine include extraction from both seams. The coal seam thickness isoapchs for the seams in the South Crandall lease area are shown on Plates 5-2(H) and 5-2(BC).

Drill hole and geological information for the area around the South Crandall lease area is shown on Plates 5-2(H) and 5-2(BC). There is only one drill hole on the South Crandall lease, HC-4. The driller's log for HC-4 is included in Appendix 6-6. The Bear Canyon seam in this hole is only 2' thick.

The information obtained from underground drill holes 1 and 2 show the Blind Canyon above the Crandall Canyon No. 1 Mine to be approximately 59 and 40 inches thick, respectively, which makes this seam unminable and of no economic value. Surface drill holes 3 and 4 indicate the Blind Canyon seam is 54 and 40 inches thick, respectively, in those areas. The Blind Canyon seam is located approximately 40 to 60 feet above the Hiawatha seam. Refer to Plate 5-2 for locations, DH-2 in Federal lease SL-062648 its location is shown on Plates 5-2(H) and 5-2(BC). There is approximately 60 acres of Blind Canyon coal at a thickness of 5 feet or more, equivalent to approximately 418,000 tons of coal in place. Although this seam remains fairly continuous across the property in the area above the Crandall Canyon No. 1 Mine, it is not mineable. In the area of the South Crandall mine the Blind Canyon seam is thicker and is considered mineable.

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Additional drilling information has been provided for the State Leases. This information is included in Appendix 6-1 and 6-5. The seam information has been translated to the isopach maps, Plates 6-3, 6-4 and 6-5. As shown on the isopach maps, the Hiawatha Seam is the only seam which is considered economically recoverable.

Five monitoring wells have also been drilled underground for ground water evaluation. Details on these wells are provided in Chapter 7, Section 7.31.21 and Appendices 7-46 and 7-47.

**Reserve Classifications.** A map is provided delineating coal outcrop lines from the Hiawatha and Blind Canyon seams with the strike and dip indicated at one point, refer to Plate 6-1.

**Stratigraphy.** The Blackhawk Formation is comprised of approximately 1,000 feet of gray carbonaceous shales, siltstones, coals and thin interbedded sandstones. The coal beds to be mined near the base of the formation are 6 to 11 feet thick and are generally classified as a high volatile bituminous coal. The Blackhawk Formation is underlain by the massive cliff-forming Star Point Sandstone, which is 200 to 400 feet thick.

Appendix 6-1 includes two stratigraphic sections which were obtained by traversing the stratigraphic column from Crandall Creek to the Castle Gate Sandstone. The entire stratigraphic column is shown in Appendix 6-1 for the permit area. A generalized stratigraphic section is provided in Appendix 6-4. This section has been confirmed by field analyses of distances between coal seams and the thickness of the overburden in the mine area, as described above. The stratigraphic section accompanies this chapter as part of Appendix 6-4.

A coal isopach (Plate 6-3) and overburden isopach map showing the depth to the minable Hiawatha Seam is included as Plate 6-6 to support extrapolation of ground water hydrology projections from nearby mines to the Crandall Canyon Mine and to support projections of subsidence.

**Structure.** Formations in the central Wasatch Plateau generally dip 1-3 degrees to the west. This regional structural attitude is broken by several north-south trending, high angle normal faults which offset the rocks from less than 10 feet to approximately 250 feet or more. As mapped, there are no major faults (other than the Joe's Valley Fault) present within the boundaries of the permit area. Springs are present in the upper reaches of the canyon near the Castlegate Sandstone-Blackhawk Formation contact. Several seeps have been noted in the Crandall permit area issuing from the Star Point Sandstone. A complete discussion of the springs and seeps encountered within the permit area is in Chapter 7.

### 6.22.3 Coal Outcrop / Strike and Dip

Coal outcrops are shown on the isopach maps (Plates 6-3, 6-4 and 6-5) and on all mine plans and progress maps (Chapter 5). Plate 6-7 is a structure contour map of the top of the Hiawatha seam.

Plates 5-2 and 6-1 show strike and dip providing an average strike over the entire area where the coal outcrop data have been obtained. An average strike designation was necessary due to the severe erosional and geographic conditions of the area, which would make anything but an average direction highly inaccurate. This dip is to the southeast, and varies slightly from the regional dip due to local geologic conditions.

#### **6.22.4 Gas and Oil Wells**

There are no gas or oil wells known to exist within, or adjacent to, the permit area.

#### **6.23 Geologic Determinations**

The acid- or toxic-forming characteristics of the strata are discussed in Sections 6.24.32 and 6.24.33 and in Appendix 6-2.

The subsidence control and monitoring plans are discussed in Section 5.25 and in Chapter 5.

#### **6.24 Geologic Information**

(1) Information presented in Section 7 indicates that the water table in the Star Point Sandstone is below the coal seams of the lower Blackhawk Formation. The flow of ground water in the formation is toward Huntington Creek.

(2) The Star Point Sandstone, which underlies the Hiawatha seam, is predominantly a light-gray massive sandstone with minor interbedded layers of shale and siltstone near its base (Doelling, 1972). In the vicinity of the mine, the Star Point Sandstone is 200-400 feet thick. The Star Point Sandstone serves as a regional aquifer (Danielson et al., 1981) yielding water to several minor and some major springs where fractured and jointed.

(3) The Blackhawk Formation (at the base of the Hiawatha seam) could contain perched aquifers in lenticular sandstones interbedded within the shales. The shales of the Blackhawk Formation are not very permeable; consequently, ground water within the formation is perched. The shales of the Blackhawk Formation are bentonitic and swell when wet; therefore, faults and fractures in the Blackhawk tend to seal, limiting secondary permeability, refer to the exceptions itemized in Section 7.

**Detailed Columns of Interest and Cross Sections.** See Appendix 6-1 included with this chapter. Stratigraphic section A was taken at the portal area and stratigraphic section B was taken 500 feet east of the portal area.

Additional information on the regional and permit area geology is presented in Section 6.21, and on maps, cross-sections and plans presented in this chapter and in Chapters 5 and 7.

Geologic literature and practices are discussed throughout this chapter and in the list of references at the end of the chapter.

### **Geologic Information Pertaining to Little Bear Spring**

The Little Bear Spring is located close to the southern boundary of the South Crandall lease area. This spring is an important source of culinary water for many residents of Emery County. In order to ensure that the spring would be protected from the effects of mining in the South Crandall lease area the Forest Service and the BLM required a number of detailed hydrology studies to ascertain the source of the spring. Based on the result of these studies the federal government has concluded that the potential for mining this lease to alter the flow of Little Bear Spring is low and has issued a Finding of No Significant Impact (FONSI) regarding the proposal to conduct mining operations within the lease. The following studies were required by the Forest Service and BLM prior to leasing action and are included in this MRP as appendices in Chapter 7. Each report includes an extensive discussion of the geology of the South Crandall tract as relates to the occurrence of ground-water, aquifers, and recharge sources of the Little Bear Spring.

- 7-51 Little Bear Spring Water Replacement Agreement
- 7-52 Supplemental Hydrogeologic Information for LBA 11
- 7-53 Summary of New Isotopic Information for LBA 11
- 7-54 Results of In-Mine Slug Tests
- 7-55 Investigation of Alluvial Ground Water System in Mill Fork Canyon
- 7-56 Investigation of Potential for Little Bear Spring Recharge
- 7-57 Determination of Recharge Location of Little Bear Spring (Dye Tracing)
- 7-58 Summary of Hydrologic Baseline Information, South Crandall Lease
- 7-59 Little Bear Spring Study (Initial study, 1998) AquaTrack
- 7-60 Little Bear Spring Study (Expanded Study, 1999) AquaTrack
- 7-61 Mill Fork Resistivity Study, 2001 AquaTrack
- 7-62 Little Bear Spring (2<sup>nd</sup> Expanded Study, 2001) AquaTrack

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11/01/93 Revised 8/31/94

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**6.24.2 Chemical Analyses of Overburden**

N/A - Strata above the coal seam will not be removed by underground mining.

**6.24.3 Chemical Analyses / Lithology**

Strata above and below the coal seam will not be mined or removed. Samples have been collected and analyzed as required.

**6.24.31 Drill Hole Logs**

Drilling results and details are summarized in Appendix 6-5. Additional information on lithology and potential impacts of mining on ground water is provided in Section 6.24 and in Chapter 7.

**6.24.32 Chemical Analyses - Strata**

**Alkalinity.** The pyrite, alkalinity and clay content information is from samples taken by applicant and submitted to Standard Laboratories, Huntington, Utah for chemical analysis. The lab reports are included with this document as Appendix 6-2.

The pyrite content and alkalinity content of the stratum immediately above the coal seams are as follows:

	Hiawatha	Blind Canyon
Pyrite	0.03%	0.09%
Paste pH	7.6	7.25
Alkalinity	63.3 mg/l	87.4 mg/l

The pyrite content, alkalinity and clay content of the stratum immediately below the coal seams are as follows:

	Hiawatha	Blind Canyon
Pyrite	0.06%	0.07%
Paste pH	3.95	3.90
Alkalinity	4.0 mg/l	0.0 mg/l
Clay Content	9.5%	10.5%

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As discussed in Section 5.28.30, waste rock is not produced during mining operations. When incidental quantities of rock are encountered, the rock is left in the mine and will not be removed at any time in the future; thus, no negative effects are expected from the acid-forming potential of strata which overlie and underlie the Hiawatha seam. However, to further characterize the acid-forming

potential of strata immediately above and below the Hiawatha seam, the applicant collected additional roof- and floor-rock samples from three equally spaced locations within the current mine workings (including the state leases and right-of-way areas). Analytical results from these three sets of samples are provided in Appendix 6-2 and are used to further characterize the acid-forming potential of the strata. The laboratory data indicate that neither the underburden or overburden are acid or toxic forming materials.

The characterization of the strata above and below the Blind Canyon Seam can not be done at this time due to no access to unweathered material. In approximately 6 months access to the Blind Canyon seam via the rock tunnel will be available. Samples and analysis will be done then.

#### **6.24.33 Chemical Analysis - Coal**

The total sulfur content of the Hiawatha coal has been analyzed at 0.58%, and the acid-base potential determined for the coal is +10.2 tons  $\text{CaCO}_3$ /1000 tons (Appendix 6-2). Under the current operation plan only a small quantity of coal is temporarily stockpiled on-site. The amount of coal remaining at the time of reclamation is likely to be insignificant. Plus, the data show that the coal is non-acid forming and non-toxic.

The characterization of the Blind Canyon Seam can not be done at this time due to no access to unweathered material. In approximately 6 months the rock tunnels from the Hiawatha seam will be completed. Samples and analysis will be done at that time.

#### **6.24.34 Properties of Strata Above and Below Coal**

This mine employs standard room and pillar mining operations and longwall technology; however, the stratigraphic sections (Appendix 6-1) and drilling results (Appendix 6-5) do not show any clays or soft rock immediately above or below the coal seam to be mined.

In the South Crandall lease area, where the Blind Canyon seam will be mined, the thickness of the clays and soft rock above and below the coal seam are shown on drill hole HC-4, Appendix 6-6. The engineering properties of these materials will be determined once the rock tunnels are constructed and access is gained to the Blind Canyon seam. Samples and analysis will be done at that time.

#### **6.25 Additional Information**

Additional information will be provided if determined necessary by the Division.

#### **6.26 Waiver of Requirements**

Not applicable.

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## **6.27 Overburden Thickness and Lithology**

Provided in Appendix 6-1 and Plate 6-6.

## **6.30 Operation Plan**

## **6.31 Casing and Sealing of Exploration Holes and Boreholes**

Exploration holes, boreholes, or other holes will not remain open for use as water supply wells or ground water monitoring wells and will normally not be completed with casing. These holes will be plugged, capped, sealed, backfilled or otherwise managed to protect water resources without the use or installation of casing, but casing will be used if it is needed to maintain boring wall integrity.

The measures to be used to close the holes will include filling the hole or opening with cuttings or inert material until it is level with the surface. Those holes which flow or might flow as a result of artesian conditions will be cemented, and any holes which penetrate two or more aquifers with significantly different ground water quality will be cased or cemented.

Installation and abandonment of monitoring wells (and other wells) will be done by a licensed driller following Division of Water Rights rules and procedures.

### **6.31.1 Temporary Casing and Sealing of Drilled Holes**

Those holes which remain open for use as water supply wells or for use as ground water monitoring well will be completed with casing or piezometers at a sufficient height above the land surface to prevent drainage of surface water or entrance of other material into the well. In addition, they will be fitted with caps to prevent introduction of foreign objects, other than monitoring and sampling equipment, into the well. When ground water monitoring wells are no longer needed or required for any purpose, each well will be sealed in accordance with the measures described above by a licensed driller following Division of Water Rights rules and procedures.

### **6.31.2 Permanent Casing and Sealing of Exploration Holes and Boreholes**

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effect, or unless approved for transfer as a water well under R645-301-731.400, each exploration hole or borehole will be plugged, capped, sealed, backfilled or otherwise properly managed under R645-301-631 and consistent with 30 CFR 75.1711. Permanent closure methods will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, and machinery and to keep acid or other toxic drainage from entering water resources.

**6.32 Subsidence Monitoring**

Subsidence monitoring is carried out on an annual basis and includes aerial surveys and visual surveys of the mine permit area. As required by R-645-301-525, a complete subsidence control plan addressing the regulations can be found in section 5.25 of this document. Projected subsidence from mining is shown on Plates 5-2(BC) and 5-2(H).

**6.40 Performance Standards**

**6.41 All Exploration Holes and Boreholes**

All exploration holes and boreholes will be permanently cased and sealed according to the requirements of R645-301-631 and R645-301-631-200.

**6.42 Monuments and Surface Markers**

All monuments and surface markers used as subsidence monitoring points and identified under R645-301-200 will be reclaimed in accordance with R645-301-521-210.

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## References

- Danielson, T.W., M.W. ReMillard. and R.H. Fuller. 1981. Hydrology of the Coal Resource Areas in the Upper Drainages of Huntington and Cottonwood Creeks, Central Utah. U.S. Geological Survey Water-Resources Investigations Open-File Report 81-539. Salt Lake City, Utah
- Davis, F.D. and H.H. Doelling. 1977. Coal Drilling at Trail Mountain, North Horn Mountain, Johns Peak Areas, Wasatch Plateau, Utah Geological and Mineral Survey Bulletin 112. Salt Lake City, Utah.
- Doelling, H.H. 1972. Central Utah Coal Fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs, and Emery. Utah Geological and Mineral Survey Monograph Series No. 3. Salt Lake City, Utah.

**APPENDIX 6-6**

**DRILL HOLE HC-4 DRILLING LOG**

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PROJECT LOCATION: HUNTINGTON CANYON UT SPUDDING DATE: 28JUN81 COMPLETION DATE: 21JUL81

DRILLING COMPANY: BEEMAN/ROBILLOW  
 DRILLERS: CUNNINGHAM-CORE  
 BIT SIZE: 6.25"  
 CORE SIZE: 2.5" NC  
 DRILLING MEDIUM: AIR-FOAM&WATER SOAP  
 CASING DEPTH: 1393  
 BEDROCK DEPTH: SURFACE  
 WATER ENCOUNTERED: 520

WELL SURVEY COMPANY: ARCO OIL&GAS/DIGILOG  
 OPERATORS: J.SMITH/R.BOUFFARD  
 LOGS: GAMMA, SP, RES, DENS, CAL  
 CEMENTED INTERVALS: 1562-1340, SURFACE, PLUG

COAL SEAM	THICKNESS	TOP	BOTTOM	COAL TONNAGE	INCR	CUM	CORE NO.	TOP	BOT	CUT	REC	TOP	BOT	CUT	REC
TKNH	BCY/TON	BCY/TON	BCY/TON	BCY/TON	BCY/TON	BCY/TON	NO.								
D	15.00	0.00	15.00	15.00	15.00	15.00	D	0.00	1391.60	0.00	0.00	0.00	1391.60	1.20	0.00
1	56.00	15.00	71.00	71.00	71.00	71.00	1	1391.60	1392.80	1.20	1.20	1.20	1392.80	10.00	10.00
2	292.80	71.00	363.80	363.80	363.80	363.80	2	1392.80	1403.50	10.70	10.00	10.00	1403.50	10.30	10.00
3	628.00	363.80	991.80	991.80	991.80	991.80	3	1403.50	1413.80	10.30	10.00	10.00	1404.60	10.00	10.40
4	1.10	991.80	992.90	992.90	992.90	992.90	4	1404.60	1515.00	10.00	10.00	10.00	1413.80	10.00	10.40
5	2.00	992.90	994.90	994.90	994.90	994.90	5	1413.80	1423.80	10.00	10.00	10.00	1423.80	10.00	10.20
6	1.90	994.90	996.80	996.80	996.80	996.80	6	1423.80	1434.00	10.00	10.00	10.00	1434.00	10.00	10.40
7	5.00	996.80	1001.80	1001.80	1001.80	1001.80	7	1434.00	1444.40	10.00	10.00	10.00	1444.40	10.00	10.10
8	9.10	1001.80	1010.90	1010.90	1010.90	1010.90	8	1444.40	1454.50	10.00	10.10	10.10	1454.50	10.00	10.60
9	3.40	1010.90	1014.30	1014.30	1014.30	1014.30	9	1454.50	1465.10	10.00	10.20	10.20	1465.10	10.00	10.20
10		1014.30	1014.30	1014.30	1014.30	1014.30	10	1465.10	1475.30	10.00	10.00	10.00	1475.30	10.00	9.00
11		1014.30	1014.30	1014.30	1014.30	1014.30	11	1475.30	1484.30	10.00	10.00	10.00	1484.30	10.00	10.20
12		1014.30	1014.30	1014.30	1014.30	1014.30	12	1484.30	1494.50	10.00	10.00	10.00	1494.50	10.00	10.10
14		1014.30	1014.30	1014.30	1014.30	1014.30	14	1494.50	1504.60	10.00	10.00	10.00	1504.60	10.00	10.00
D		1014.30	1014.30	1014.30	1014.30	1014.30	D	1515.00	1525.00	10.00	10.00	10.00	1515.00	10.00	0.00
		1525.00	1525.00	1525.00	1525.00	1525.00		1525.00	1564.50	0.00	0.00	0.00	1564.50	0.00	0.00

\*\*\* COAL SUMMARY \*\*\*

THICKNESS BCY/TON INCR BCY/TON \*\*\*

COAL SEAM TKNH TOP BOTTOM THICKNESS BCY/TON INCR BCY/TON CUM BCY/TON

D 15.00 0.00 15.00 15.00 15.00

1 56.00 15.00 71.00 71.00 71.00

2 292.80 71.00 363.80 363.80 363.80

3 628.00 363.80 991.80 991.80 991.80

4 1.10 991.80 992.90 992.90 992.90

5 2.00 992.90 994.90 994.90 994.90

6 1.90 994.90 996.80 996.80 996.80

7 5.00 996.80 1001.80 1001.80 1001.80

8 9.10 1001.80 1010.90 1010.90 1010.90

9 3.40 1010.90 1014.30 1014.30 1014.30

10

11

12

14

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TOP	BOTTOM	THICK	FORM- ATION SEAM	ROCK CODE TYPE	DESCRIPTION
0.00	15.00	15.00	TKNH	300 SHALE	WITH SANDSTONE INTERBEDS:
15.00	71.00	56.00	KPV	600 SANDSTONE	: TOP UNIT OF 'GREAT WHITE' SS
71.00	91.50	20.50		320 SHALE	WITH SANDSTONE INTERBEDS, 25 - 50% SS:
91.50	159.00	67.50		600 SANDSTONE	: LOWER UNIT OF GREAT WHITE SS
159.00	354.00	195.00	KC	320 SHALE	WITH SANDSTONE INTERBEDS, 25 - 50% SS: BASE OF PRICE RIVER
354.00	520.00	166.00	KC	630 SANDSTONE	LIGHT, VERY FINE-FINE GRAINED:
520.00	541.00	21.00	KC	320 SHALE	WITH SANDSTONE INTERBEDS, 25 - 50% SS: SHALE UNIT OF CASTLEGATE SS
541.00	646.80	105.80	KC	630 SANDSTONE	LIGHT, VERY FINE-FINE GRAINED: LOWER UNIT OF CASTLEGATE
646.80	1274.80	628.00	KB	300 SHALE	WITH SANDSTONE INTERBEDS:
1274.80	1275.80	1.00	UNN	900 COAL	:
1275.80	1295.40	19.60	UNN	300 SHALE	WITH SANDSTONE INTERBEDS:
1295.40	1296.50	1.10	UNN	900 COAL	:
1296.50	1371.00	74.50	UNN	300 SHALE	WITH SANDSTONE INTERBEDS:
1371.00	1373.00	2.00	UNN	900 COAL	:
1373.00	1385.00	12.00	UNN	300 SHALE	WITH SANDSTONE INTERBEDS:
1385.00	1391.60	6.60	UNN	500 SANDSTONE	WITH SHALE INTERBEDS:
1391.60	1392.80	1.20	UNN	513 SANDSTONE	BEDED: 5 - 25% SHALE VERY FINE TO FINED GRAINED, RIPPLE
1392.80	1393.20	0.40	UNN	513 SANDSTONE	BEDED: 5 - 25% SHALE VERY FINE TO FINED GRAINED, RIPPLE
1393.20	1393.50	0.30	UNN	420 SILTSTONE	BEDED:
1393.50	1394.00	0.50	UNN	163 CLAYSTONE	DARK: FG INTBDS SOFT SED. DEFORMATION
1394.00	1394.20	0.20	UNN	922 COAL	DARK, HARD, ABUNDANT SLICKENSIDES: COAL STREAKS
1394.20	1394.50	0.30	UNN	252 SHALE	MEDIUM BRIGHT-BRIGHT, BLOCKY: BANDED RESINOUS
1394.50	1399.00	4.50	UNN	933 COAL	BLACK, HARD, PLATY: CARB COAL STREAKS
1399.00	1399.20	0.20	UNN	970 FUSAIN	DULL-MEDIUM BRIGHT, BLOCKY WITH CALCITE CLEAT FILL: RESINOUS
1399.20	1399.40	0.20	UNN	920 COAL	: RESINOUS
1399.40	1401.00	1.60	UNN	0 LOST	MEDIUM BRIGHT-BRIGHT: V. BROKEN
1401.00	1402.30	1.30	UNN	160 CLAYSTONE	: COAL-GEOPHYSICAL LOG
1402.30	1402.70	0.40	UNN	252 SHALE	DARK, HARD: COAL SPARS
1402.70	1403.20	0.50	UNN	920 COAL	BLACK, HARD, PLATY: CARB COAL STREAKS RESINOUS
1403.20	1403.30	0.10	UNN	252 SHALE	MEDIUM BRIGHT-BRIGHT: RESINOUS
1403.30	1403.50	0.20	UNN	163 CLAYSTONE	BLACK, HARD, PLATY: CARB COAL STREAKS
1403.50	1404.20	0.70	UNN	163 CLAYSTONE	DARK, HARD, ABUNDANT SLICKENSIDES: COAL BANDS
1404.20	1405.30	1.10	UNN	923 COAL	DARK, HARD, ABUNDANT SLICKENSIDES: COAL BANDS
1405.30	1405.90	0.60	UNN	923 COAL	MEDIUM BRIGHT-BRIGHT, BLOCKY WITH CALCITE CLEAT FILL: RESINOUS
1405.90	1406.20	0.30	UNN	0 LOST	V. BROKEN
1406.20	1406.80	0.60	UNN	428 SILTSTONE	: COAL-GEOPHYSICAL LOG
1406.80	1407.20	0.40	UNN	252 SHALE	DARK, ROOTED:
1407.20	1409.10	1.90	UNN	922 COAL	BLACK, HARD, PLATY: CARB SLKN
1409.10	1409.60	0.50	UNN	252 SHALE	MEDIUM BRIGHT-BRIGHT, BLOCKY: RESINOUS
1409.60	1413.80	4.20	UNN	428 SILTSTONE	BLACK, HARD, PLATY: CARB SLKN
1413.80	1423.80	10.00	UNN	438 SILTSTONE	DARK, ROOTED: CARB COAL BANDS COARSENS UPWARD
1423.80	1427.60	3.80	UNN	517 SANDSTONE	LIGHT, ROOTED: BURROWED AT BASE
1427.60	1429.00	1.40	UNN	722 CONGLOMERATE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINE GRAINED, BURROWED:
1429.00	1429.80	0.80	UNN	540 SANDSTONE	SANDSTONE MATRIX, SHALE PEBBLES: FG MATRIX LT GREY
1429.80	1434.00	4.20	UNN	674 SANDSTONE	W/SHALE INTBDS., 25-50% SHALE. MED. TO COARSE GR.:
1434.00	1437.70	3.70	UNN	664 SANDSTONE	LIGHT, MEDIUM - COARSE GRAINED, CROSS-BEDED: COAL SPARS SOFT
1437.70	1439.10	1.40	UNN	676 SANDSTONE	SED. DEFORMATION
1439.10	1440.10	1.00	UNN	252 SHALE	DARK, MEDIUM - COARSE GRAINED, CROSS-BEDED: COARSE FOS CALCAREOUS
1440.10	1444.40	4.30	UNN	428 SILTSTONE	SHALE AND QTZ PEBBLES
1444.40	1449.70	5.30	UNN	438 SILTSTONE	LIGHT, MEDIUM - COARSE GRAINED, WITH COAL INCLUSIONS: MEDIUM GRND

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TOP	BOTTOM	THICK	FORM- ATION SEAM	ROCK ROCK CODE TYPE	DESCRIPTION
1449.70	1450.70	1.00		426 SILTSTONE	DARK, WITH COAL INCLUSIONS: FOSSILIZED BONE PYR CALCAREOUS
1450.70	1451.80	1.10		160 CLAYSTONE	DARK, HARD:
1451.80	1452.50	0.70		252 SHALE	BLACK, HARD, PLATY: RESINOUS COAL BANDS
1452.50	1452.60	0.10		920 COAL	MEDIUM BRIGHT-BRIGHT: BANDED
1452.60	1452.90	0.30		252 SHALE	BLACK, HARD, PLATY: COAL BANDS
1452.90	1454.20	1.30		422 SILTSTONE	DARK, MASSIVE:
1454.20	1454.50	0.30		513 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINED GRAINED, RIPPLE BEDDED: CALCAREOUS
1454.50	1458.60	4.10		513 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINED GRAINED, RIPPLE BEDDED: CALCAREOUS COAL STKAT BASE
1458.60	1458.80	0.20	UNN	965 BONE	BLOCKY WITH PYRITE CLEAT FILL: COAL BANDS RESINOUS 0.05 BLACK CARB SH AT BASE
1458.80	1460.30	1.50	UNN	922 COAL	MEDIUM BRIGHT-BRIGHT, BLOCKY: RESINOUS BROKEN
1460.30	1463.70	3.40	UNN	252 SHALE	BLACK, HARD, PLATY: 50% COAL STREAKS
1463.70	1465.10	1.40		426 SILTSTONE	DARK, WITH COAL INCLUSIONS: CARB
1465.10	1469.10	4.00		426 SILTSTONE	DARK, WITH COAL INCLUSIONS:
1469.10	1470.60	1.50		517 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINE GRAINED, BURROWED: COAL STREAKS
1470.60	1473.10	2.50		426 SILTSTONE	DARK, WITH COAL INCLUSIONS: FOS
1473.10	1475.30	2.20		518 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINE GRAINED, ROOTED: BURROWED CALCAREOUS V. HD
1475.30	1479.30	4.00		634 SANDSTONE	LIGHT, VERY FINE-FINE GRAINED, CROSS-BEDED: CALCAREOUS HD
1479.30	1481.70	2.40		517 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINE GRAINED, BURROWED: CALCAREOUS HD
1481.70	1483.30	1.60		514 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINED GRAINED, CROSS-BEDED: CALCAREOUS
1483.30	1484.30	1.00		634 SANDSTONE	LIGHT, VERY FINE-FINE GRAINED, CROSS-BEDED: CALCAREOUS
1484.30	1490.00	5.70		513 SANDSTONE	WITH SHALE INTBDS., 5 - 25% SHALE VERY FINE TO FINED GRAINED, RIPPLE BEDDED: SH PEBBLE CLASTS FINING UPWARD CALCAREOUS
1490.00	1494.50	4.50		534 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, CROSS-BEDED: FINING UPWARD
1494.50	1504.60	10.10		534 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, CROSS-BEDED: CALCAREOUS
1504.60	1510.00	5.40		534 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, CROSS-BEDED: CALCAREOUS
1510.00	1515.00	5.00	HIA	925 COAL	MEDIUM BRIGHT-BRIGHT, BLOCKY WITH PYRITE CLEAT FILL: BANDED RESINOUS CALCITE CLEAT FILL
1515.00	1515.50	0.50	HIA	538 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, ROOTED: CHURNED CARB
1515.50	1515.60	0.10	UNN	923 COAL	MEDIUM BRIGHT-BRIGHT, BLOCKY WITH CALCITE CLEAT FILL:
1515.60	1520.00	4.40	KSP	538 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, ROOTED: RIPPLED CALCAREOUS
1520.00	1525.00	5.00	UNN	534 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, CROSS-BEDED: CARB DEBRIS CALCAREOUS
1525.00	1564.50	39.50	KSP	534 SANDSTONE	W/SHALE INTBDS., 5-25% SHALE, MED. TO COARSE GRAINED, CROSS-BEDED: CARB DEBRIS, OPHIOMORPHA, CALCAREOUS

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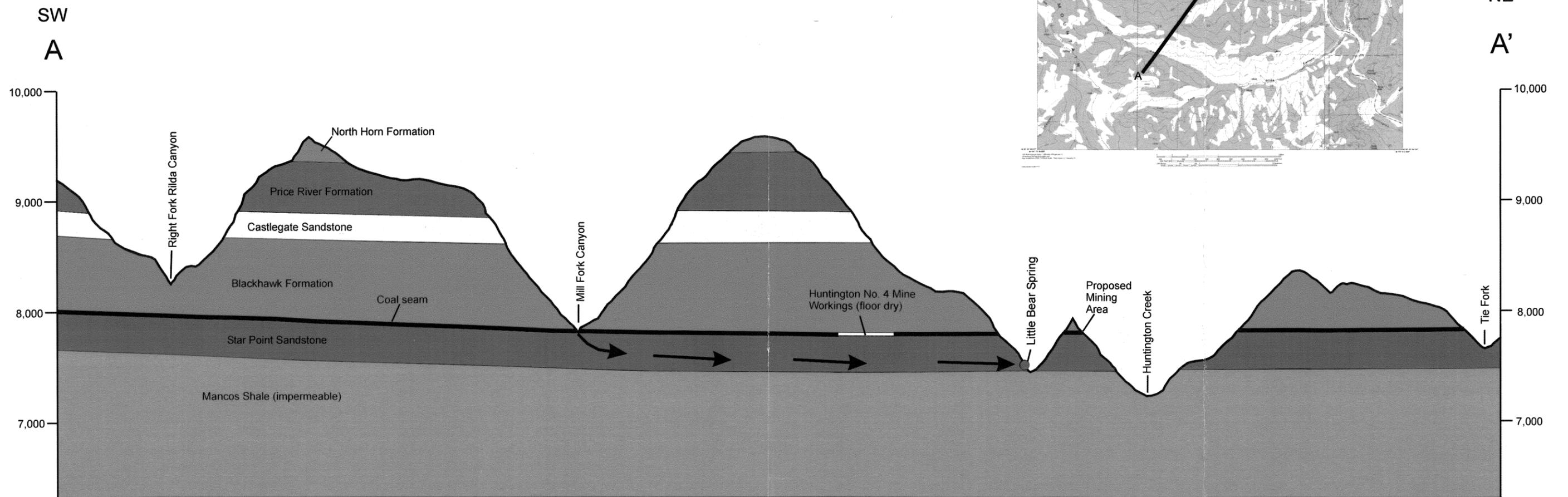
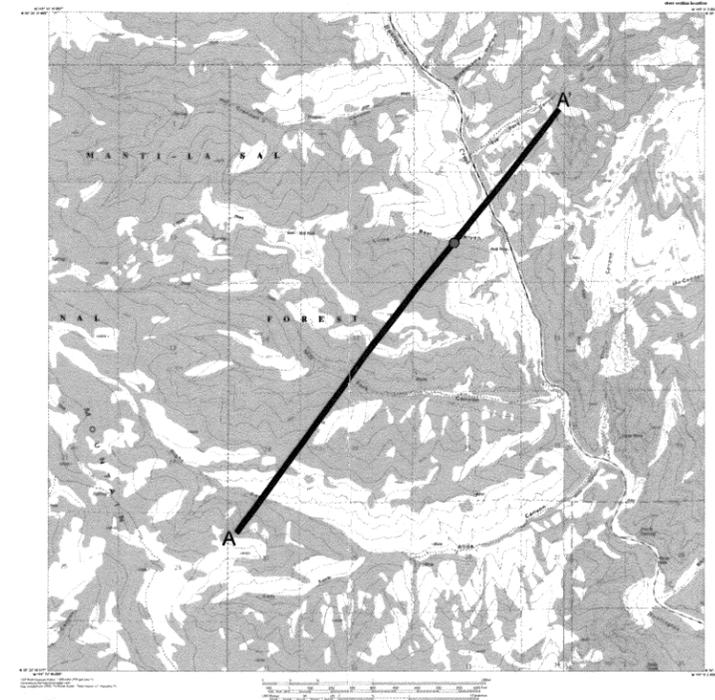
**APPENDIX 6-7**

**GENERALIZED GEOLOGIC CROSS SECTION  
SOUTH CRANDALL LEASE AREA**

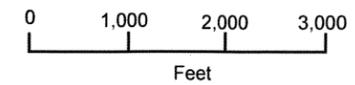
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- |                         |                        |
|-------------------------|------------------------|
| ■ North Horn Formation  | ■ Blackhawk Formation  |
| ■ Price River Formation | ■ Star Point Sandstone |
| □ Castlegate Sandstone  | ■ Mancos Shale         |



2X vertical exaggeration

Generalized cross-section along the trace of the fracture system from which Little Bear Spring discharges. Note that the elevation of the bottom of the Mill Fork drainage is approximately 200 feet higher than Little Bear Spring.

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