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

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Salt Lake City, Utah 84180-1203
801-538-5340

July 31, 1989

Mr. C. F. Vaughn, President
Nevada Electric Investment Company
6226 West Sahara
Las Vegas, NV 89102

Dear ~~Mr. Vaughn~~ Charlie:

Re: Revised State Permit and Decision Package, Genwal Coal Company, Crandall Canyon Mine, ACT/015/032, Folder #3, Emery County, Utah

Enclosed is a revised permanent program mining permit for the Crandall Canyon Mine, which includes new lease U-54762. Also included is a copy of the State's Decision Document and Technical Analysis for the lease addition.

Please note that for purposes of responding to the stipulations, the permit approval date is the date on the top of the first page of the revised permit, July 27, 1989. The permit will still expire on the renewed permit expiration date, May 13, 1993. Two copies of the permit are included. Please read the stipulations in Attachment A, then sign both copies and return one to the Division.

Your cooperation during the permitting process is appreciated.

Best Regards,

Dianne

Dianne R. Nielson
Director

Enclosures
cc: P. Rutledge, OSM
R. Hagen, OSM
A. Childs, Genwal
G. Morris
B Team
PFO
BT45/270

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UTAH DIVISION OF OIL, GAS & MINING
STATE DECISION DOCUMENT AND
TECHNICAL ANALYSIS

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

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* Stipulations
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* Letters of Concurrence

    U. S. Forest Service - Manti-LaSal National Forest, February 9, 1989
    Bureau of Land Management, January 27, 1989
    Utah Division of Wildlife Resources, January 31, 1989
    U.S. Fish and Wildlife Service, February 28, 1989
    Division of State History, November 28, 1988
    Office of Surface Mining Reclamation and Enforcement Relatedness Report, July 31, 1989

* Revised Permit

ADMINISTRATIVE OVERVIEW

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

BACKGROUND

Genwal Coal Company, Inc. (Genwal) has proposed to add an underground lease to its currently approved permit area for the Crandall Canyon Mine.

The Mining and Reclamation Plan for the Crandall Canyon Mine, Tract 1, was approved by the Office of Surface Mining in November of 1982 and by the Division of Oil, Gas, and Mining (DOGM) on May 13, 1983. The originally approved MRP consisted of an 80 acre federal lease (SL-062648, Tract 1), a 1.5 acre U.S. Forest Service special use area, and a 1.7 acre fee lease. On February 12, 1987 Genwal was issued a permit from DOGM to add Tract 2 of Lease SL-062648 to the permit area, containing 75.23 acres. DOGM is currently conducting a permit renewal review for Tracts 1 and 2 in accord with the permit renewal requirements of the Utah State Program.

In December of 1986, Genwal was issued federal lease U-54762, containing 256.49 acres. In February of 1988, Genwal submitted a new MRP document in partial fulfillment of requirements for permit renewal. This new MRP contained information pertaining to the addition of lease U-54762 to the permit area.

Currently the Crandall Canyon Mine consists of room and pillar operations in the Hiawatha seam. These practices will continue into the new lease area. An upper seam, the Blind Canyon seam, is not mineable in the existing permit area. If it is determined that this seam is economical to mine in the new lease area, plans will be developed for mining it. Lease U-54762 contains approximately 2.5 million tons of coal in place, of which it is estimated that 1.5 million is recoverable.

ANALYSIS

No additional surface disturbance is proposed in relation to the addition of this lease to the permit area. This Technical Analysis (TA) addresses specifically effects related to the underground mining of Lease U-54762. It is DOGM's opinion that the sections addressed in the following TA differ significantly from the mining and reclamation practices and procedures which were approved in the current permit. Those sections of the rules not addressed here were determined to be in compliance with the approved MRP and have been addressed in previous TA's.

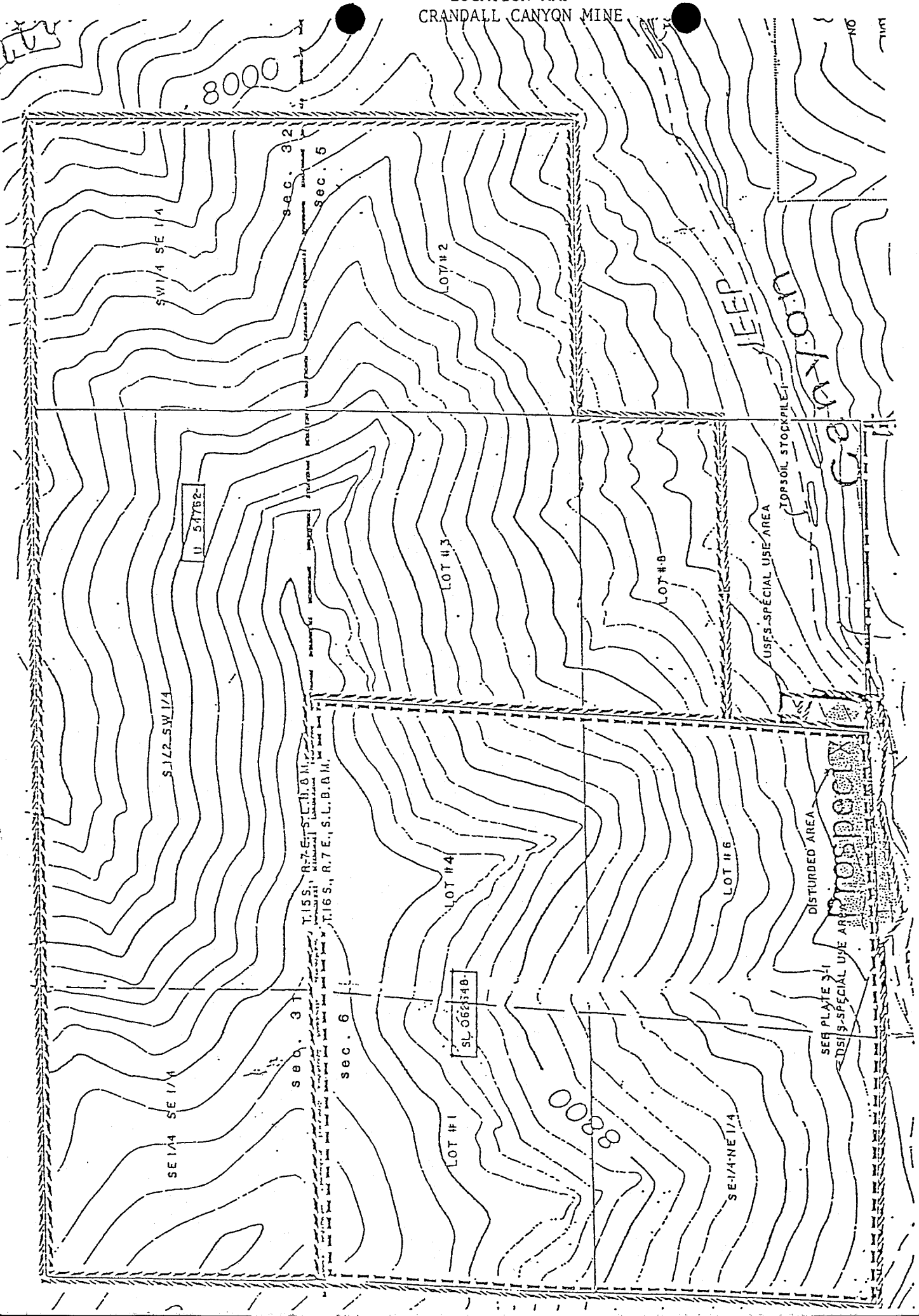
Two specific issues were raised and resolved during the review of this proposed permitting action. The first consisted of a potential impact on a historic eagle nest which lies above the coal lease. Genwal proposed to undermine this area. The Utah Division of Wildlife Resources (DWR) objected, due to the potential for cliff spalling, caused by subsidence. Genwal has committed to leave barrier pillars around the nest if monitoring of the nest shows it to be active at the time of retreat mining. DWR and the U.S. Fish & Wildlife Service have accepted this plan (see letters attached to TA).

The second issue involved potential subsidence of the escarpment in Huntington Canyon. Concerns were raised by the U.S. Forest Service (USFS) due to the fact that no exploration of seam U-54762 has been done, and the depth and thickness of the coal seam is uncertain. The USFS requested that the Bureau of Land Management (BLM) assess the potential for escarpment failure in Huntington Canyon due to mining of this lease. In a letter dated January 27, 1989 (attached to the TA) the BLM concluded that the proposed mining would not cause slope or escarpment failure. The USFS has accepted this and approved the MRP, with the contingency that frequent monitoring is done (see Stipulation UMC 817.126 - (1) -DD).

RECOMMENDATION

Genwal has demonstrated that mining of the new lease can be done in conformance with the Surface Mining Control and Reclamation Act, and the corresponding Utah Act and Performance Standards. The Bureau of Land Management has approved the mining plan for the new federal lease. All issues raised during the review process have been resolved or will be attached as stipulations to the permit approval. No issues were raised during the public comment period. It is therefore recommended that approval be given for addition of lease U-54762 to the currently approved permit area, with the stipulations as delineated in this Decision Document.

LOCATION MAP
CRANDALL CANYON MINE



PERMITTING CHRONOLOGY

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

2/11/88	Genwal Coal Company, Inc. (Genwal) submits updated Mining and Reclamation Plan (MRP), including plans for incorporation of Lease U-54762 into the permit area.
5/3/88	Division of Oil, Gas and Mining (DOGM) sends Genwal deficiency review, including deficiencies regarding new lease.
8/15/88 9/8/88	Genwal submits additional information.
10/26/88	DOGM determines MRP to be apparently complete.
10/31/88	DOGM forwards notice of a complete permit application to all other interested agencies.
10/25-11/15/88	Genwal publishes notice of a complete plan and intent to add Lease U-54762 to the permit area weekly for four consecutive weeks in the Price Sun Advocate.
12/2,5,7 and 28/88	Genwal submits additional information to address technical deficiencies in the MRP.
12/15/88	Public comment period ends with no comments received.
3/8/89	DOGM forwards State Decision Document and Technical Analysis to Office of Surface Mining Reclamation and Enforcement for concurrence and secretarial signature.
7/19/89	Federal Decision Document signed by Assistant Secretary of the Interior.
7/31/89	DOGM issues state Decision Document, revised permit.

MINE PLAN INFORMATION

Mine Name: Crandall Canyon Mine
Operator: Genwal Coal Company

State ID: ACT/015/032
County: Emery

Controlled By: Nevada Electric Investment Co.
Contact Person(s): Andy King
Telephone:: 687-9813

Position: Mine Manager

New/Existing: both Mining Method: Underground-room and pillar

Federal Lease No(s).: U-54762; SL-062648
Legal Description(s): U-54762: T. 15S., R. 7E. Section 31: SE 1/4 SE 1/4, Section 32: S 1/2 SW 1/4, SW 1/4 SE 1/4; T.16S, R.7E. Section 5: Lots 2, 3, and 8; SL-062648: T. 16S., R. 7E. Section 5: SW 1/4 NW 1/4, Lot 4, Section 6: SE 1/4 NE 1/4, Lot 1

State Lease No(s).: NA
Legal Description(s):

Other Leases (identify): NA

Legal Description(s):

Ownership Data:

Surface Resources (acres)	Existing Permit Area	Proposed Permit Area	Total Life Of Mine Area
Federal	157.73	256.49	414.22
State			
Private	1.7		1.7
Other			
TOTAL	159.43	256.49	415.92

Coal Ownership (acres):

Federal	155.23	256.49	411.72
State			
Private			
Other			
TOTAL	155.23	256.49	411.72

Coal Resource Data	Total Reserves (1981)	Total Recoverable Reserves (1981)
Federal	2.9 million	1.75 million
State		
Private		
Other		
TOTAL	2.9 million	1.75 million

Recoverable Reserve Data	Name	Thickness	Depth
Seam	Hiawatha	7' max.	400'
Seam			
Seam			
Seam			
Seam			
Seam			

*Not applicable as this is reclamation only.

Mine Life: 12 years
Average Annual Production: 360,000 Percent Recovery: 60%
Date Projected Annual Rate Reached: Unknown
Date Production Begins: 1983 Date Production Ends: 1994
Reserves Recoverable By: (1) Surface Mining:
(2)Underground Mining: XX
Reserves Lost Through Management Decisions: NA
Coal Market: Unknown

Modifications that have been approved:	Date:
Tract 2 Permit Approval	Feb.12, 1987

FINDINGS

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

1. The revised plan and the permit application are accurate and complete and all requirements of the Surface Mining Control and Reclamation Act (the "Act"), and the approved Utah State Program have been complied with (UMC 786.19{a}).

2. No additional surface reclamation is required since the additional permit area will be mined as an underground extension of the existing mine. There will be no new surface facilities.

3. The assessment of the probable cumulative impacts of all anticipated coal mining and reclamation activities in the general area on the hydrologic balance has been made by the regulatory authority. The Mining and Reclamation Plan (MRP) proposed under the application has been designed to prevent damage to the hydrologic balance in the permit area and in associated off-site areas (UMC 786.19 {c} and UCA 40-10-11 {2}{c}) (See Cumulative Hydrologic Impact Analysis (CHIA) following this Findings Document).

4 The proposed lands to be included within the permit area are:

   a. not included within an area designated unsuitable for underground coal mining operations (MRP, p. 2-7);

   b. not within an area under study for designated lands unsuitable for underground coal mining operations (MRP, p. 2-7);

   c. not on any lands subject to the prohibitions or limitations of 30 CFR 761.11 {a} (national parks, etc.), 761.11 {f} (public buildings, etc.) and 761.11 {g} (cemeteries) (MRP, p. 2-6);

d. within 100 feet of a public road, however a hearing was held as required in June of 1981 (MRP, p.2-6);

e. not within 300 feet of any occupied dwelling (MRP, p. 2-6) (UMC 786.19 {d}).

5. The regulatory authority's issuance of a permit is in compliance with the National Historic Preservation Act and implementing regulations (36 CFR 800) (UMC 786.19 {e}). See attached letter from State Historic Preservation Officer (SHPO) dated November 28, 1988.

6. The applicant has the legal right to enter and complete mining activities in the new lease area through a federal coal lease agreement (UMC 786.19 {f}).

7 A 510(c) report has been run on the Applicant Violator System (AVS), which shows that: prior violations of applicable laws and regulations have been corrected; neither Genwal Coal Company, Inc. or its parent company are delinquent in payment of fees for the Abandoned Mine Reclamation Fund; and the applicant does not control and has not controlled mining operations with demonstrated pattern of willful violations of the Act of such nature, duration, and with such resulting irreparable damage to the environment as to indicate an intent not to comply with the provisions of the Act (UMC 786.19 {g}{h}{i}) (See OSMRE Relatedness Report, attached to TA).

8. Underground mining operations to be performed under the permit will not be inconsistent with other operations anticipated to be performed in areas adjacent to the proposed permit area. The closest operating mine is the Bear Canyon Mine.

9. The applicant has posted a surety bond for the Crandall Canyon Mine in the amount of $268,000.00. No additional surety will be required, since there is no additional surface disturbance proposed (UMC 786.19 {k}).

10. No lands designated as prime farmlands or alluvial valley floors occur on the permit area (UMC 786.19 {l}) (See MRP Items 8-2, 8-3.)

11. The proposed postmining land-use of the permit area is the same as the pre-mining land use and has been approved by the regulatory authority and the surface land management agency (UMC 786.19 {m}).

12. The regulatory authority has made all specific approvals required by the Act, the Cooperative Agreement and the Federal Lands Program (UMC 786.19{n}).

13. The proposed operation will not affect the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habits (UMC 786.19 {o}) (See MRP p. 10-5).

14. All procedures for public participation required by the Act, and the approved Utah State Program have been complied with (UMC 786.11- .15).

15. No existing structures will be used in conjunction with mining of the underground lease additions, other than those constructed in compliance with the performance standards and subchapter K under the existing permit (UMC 786.21).

Susan C. Linner
Permit Supervisor

Lowell P. Braxton
Associate Director, Mining

Dianne R. Nielson
Director

CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT

Genwal Coal Company
Crandall Canyon Mine
ACT/015/032
Emery County, Utah

July 31, 1989

I. Introduction

This report is to provide a Cumulative Hydrologic Impact Assessment (CHIA) for Genwal Coal Company's Crandall Canyon Mine located in Emery County, Utah. The material provided in this report evaluates the probable cumulative impacts of anticipated coal mining and assesses the operation procedures proposed under the application to ensure they are designed to prevent damage to the hydrologic balance within and outside the proposed mine plan area. This report complies with federal legislation passed under the Surface Mining Control and Reclamation Act (SMCRA) and subsequent Utah and federal regulatory programs under UMC 786.19(c) and 30 CFR 784.14(f), respectively.

Genwal Coal Company's Crandall Canyon Mine is located along the eastern margin of the Wasatch Plateau Coal Field approximately 15 miles west of Huntington, Utah (Figure 1). The eastern margin of the Wasatch Plateau forms a rugged escarpment that overlooks Castle Valley and the San Rafael Swell to the east. Elevations along the eastern escarpment of the Wasatch Plateau range from approximately 6,500 to over 9,000 feet.

Outcropping rocks of the Wasatch Plateau Coal Field range from Upper Cretaceous to Quaternary in age. The rock record reflects an overall regressive sequence from marine (Mancos Shale) through littoral and lagoonal (Blackhawk Formation) to fluvial (Castlegate Sandstone, Price River Formation and North Horn Formation) and lacustrine (Flagstaff Formation) depositional environments. Oscillating depositional environments within the overall regressive trend are represented by lithologies within the Blackhawk Formation. The major coal-bearing unit within the Wasatch Plateau Coal Field is the Blackhawk Formation.

Precipitation varies from 40 inches at higher elevations to less than 10 inches at lower elevations. The Wasatch Plateau may be classified as semiarid to subhumid.

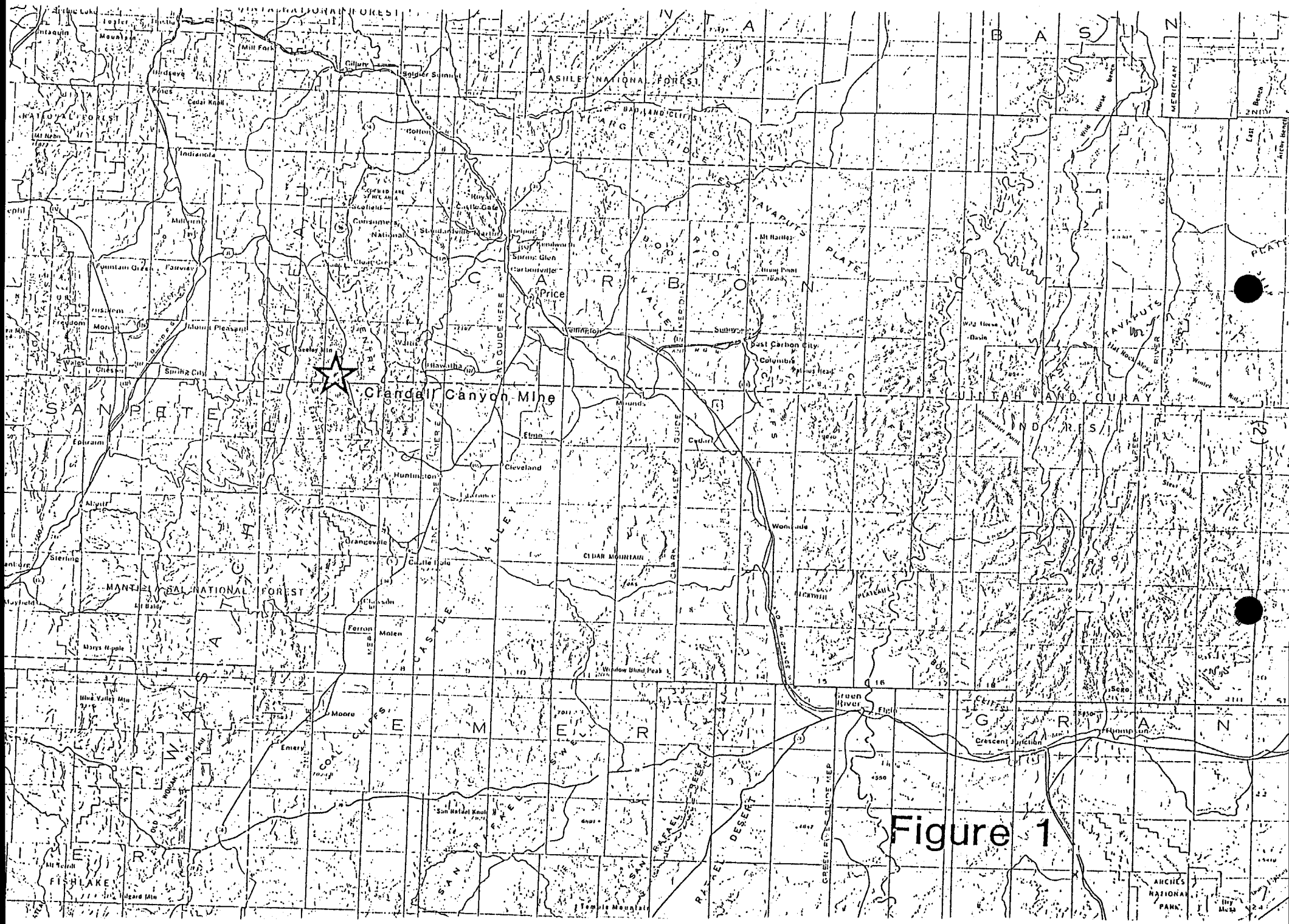

Crandall Canyon Mine
Price
East Carbon City
Columbia
Wellington
Sunnyside
Scofield
Consumers
Castle Gate
Helper
Spring Glen
Carbonville
Fairview
Fountain Green
Mount Pleasant
Spring City
Ephraim
Huntington
Cleveland
Elmo
Cedar
Orangeville
Castle Dale
Clawson
Ferron
Molen
Emery
Moore
Green River
Crescent Junction
Thompson
Woodside
Mounds
Sterling
Mayfield
Indianola
Cedar Knoll
Mill Fork
Gilluly
Soldier Summit
Cotton
Royal
Standardville
Martin
Kenilworth
Mt Hartley
Wild Horse Basin
Wild Horse Bench
East Bench
Arches National Park
Dry Mesa
Temple Mountain
San Rafael Knob
Window Blind Peak
Blue Valley Mtn
Mt Terrill
Fishlake
Marys Nipple
Cedar Mountain
Coal Cliffs
Book Cliffs
Bad Land Cliffs
Wasatch Plateau
Tavaputs Plateau
Uinta Basin
Sanpete Valley
Castle Valley
San Rafael Desert
Green River Guide Mer
Salt Lake Guide Mer
Uintah and Ouray Ind Res
Ashley National Forest
Manti-La Sal National Forest
Uinta National Forest
Carbon
Emery
Grand
Sanpete
Wasatch
Meridian
Tavaputs Plateau
Green River
Sego

Figure 1

Vegetation varies from the Sagebrush/Grass community type at lower elevations to the Douglas Fir/Aspen community at higher elevations. Other vegetative communities include Mountain Brush, Pinyon-Juniper, Pinyon-Juniper/Sagebrush and Riparian. These communities are primarily used for wildlife habitat and livestock grazing.

Crandall Creek which flows past the Crandall Canyon Mine is a perennial tributary to Huntington Creek which is a tributary to the San Rafael River. The upper drainage of Huntington Creek encompasses about 200 square miles of mountainous country in the Wasatch Plateau. About 90 percent of the area is higher than 8,000 feet. The average channel gradient along Huntington Creek is about 100 feet per mile. The lower reaches of the tributaries to Huntington Creek typically have surface relief between the stream channels and tops of adjacent canyon walls of 2,000 feet or more.

II. Cumulative Impact Area (CIA)

Figure 2 delineates the current (SL-062648) and proposed (U-54762) Leases for the Crandall Canyon Mine operations as well as the CIA. The CIA includes the Crandall Canyon drainage and a portion of Huntington Creek. The CIA boundary is defined on the north by an unnamed canyon between Crandall and Blind Canyons and the drainage divide that separates those canyons, to the south and west by the Crandall Canyon drainage divide and on the east by Huntington Creek. The CIA encompasses approximately 4,290 acres.

III. Scope of Mining

Historically, mining was conducted near this site from November of 1939 to September of 1955. Mining in Tract 1 by Genwal Coal Company began in 1983.

Genwal Coal Company currently controls approximately 158 acres in Huntington Canyon in Emery County, Utah (see Figure 3). Lease SL-062648 was mined in sequence as Tracts 1 (southern half) and 2 (northern half). Lease SL-062648 contained approximately 400,000 tons of recoverable coal. Of the recoverable coal available, 170,000 tons has been mined for advance work and 230,000 tons will be mined on final retreat. Lease U-54762 contains approximately 2.5 million tons in place of which 1.5 million tons is recoverable.

Access to the Lease U-54762 will be gained by extending the existing North Main entries into the new permit area. The same surface facilities established for Lease SL-062648 will be used for Lease U-54762.

The current method of room and pillar mining in use for Lease SL-062648 will be continued throughout Lease U-54762. Pillars will be removed upon abandonment of sections. Overall, an advance-retreat mining system is projected for the mine.

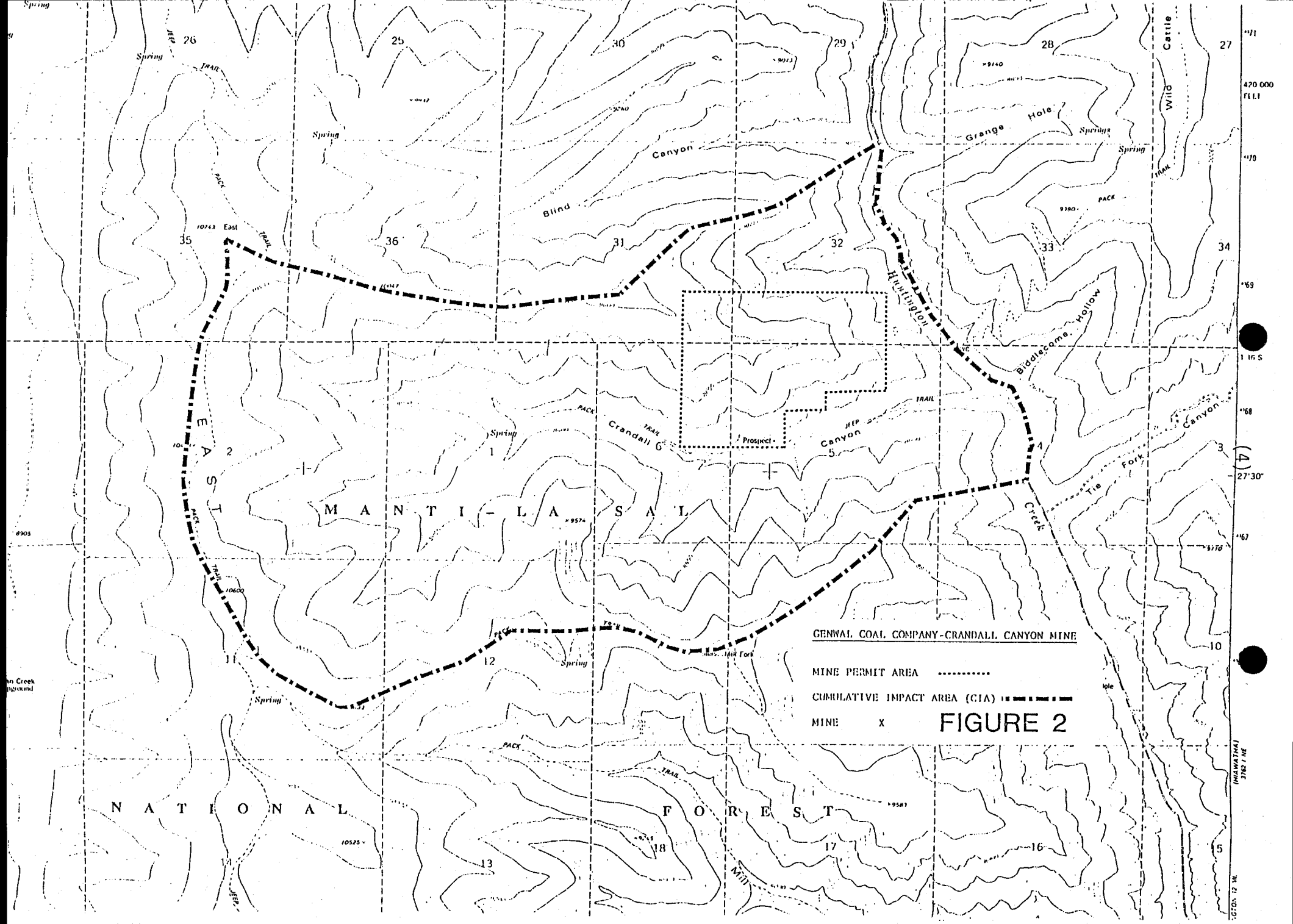

GENWAL COAL COMPANY-CRANDALL CANYON MINE
MINE PERMIT AREA
CUMULATIVE IMPACT AREA (CIA)
MINE X
M A N T I - L A S A L
N A T I O N A L F O R E S T
E A S T
Blind Canyon
Grange Hole
Wild Cattle
Huntington Creek
Biddlecome Hollow
Tie Fork Canyon
Crandall Canyon
Prospect
Mill
Spring
PACK TRAIL
JEEP TRAIL
East
420 000 FEET
27'30"
(4)

FIGURE 2

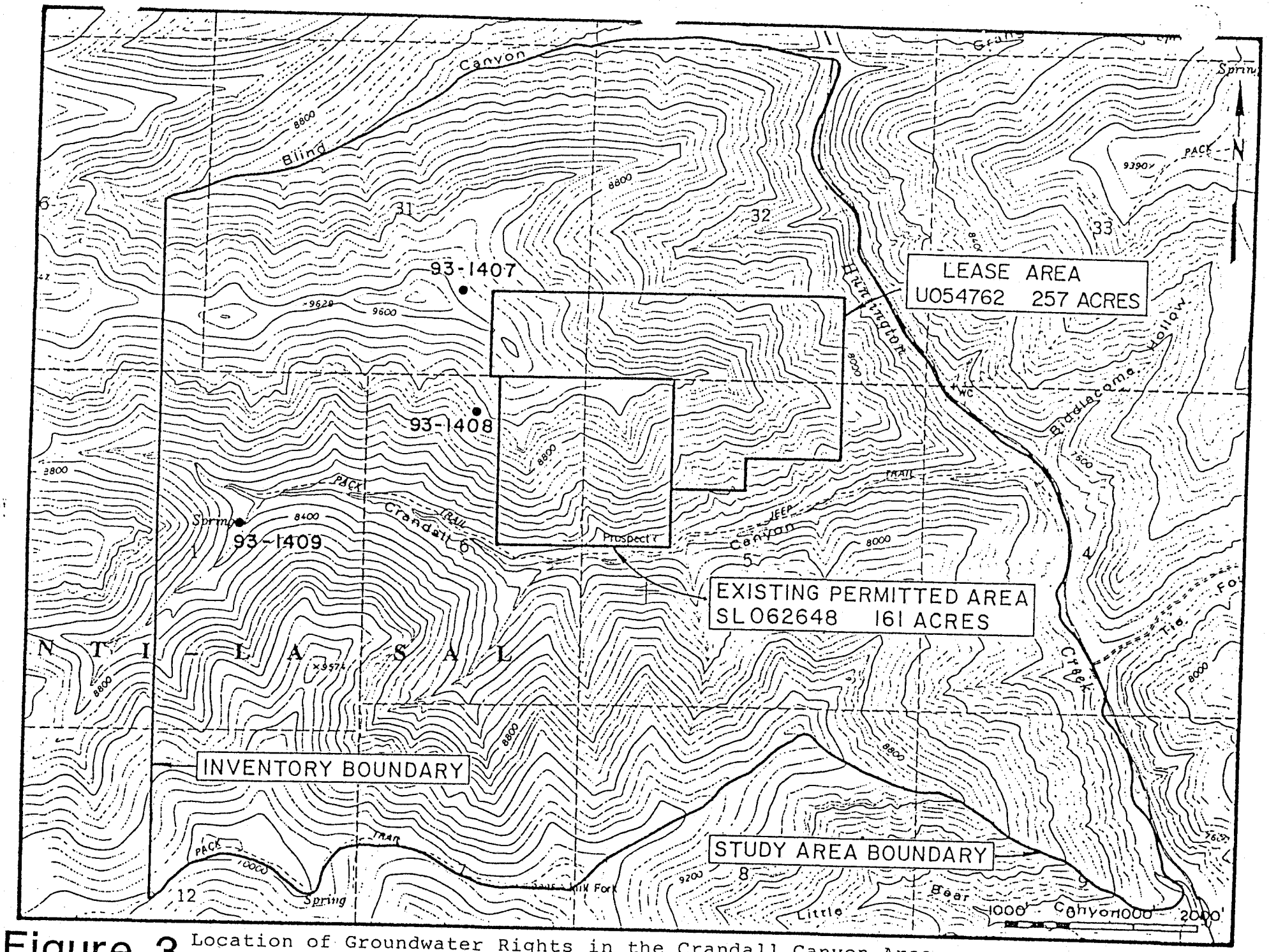


Figure 3 Location of Groundwater Rights in the Crandall Canyon Area.

The permit area is comprised of coal lands leased by Genwal Coal Company from the United States Bureau of Land Management, under leases SL-062648 and U-54762. The surface lands are controlled by the United States Forest Service, Manti-LaSal National Forest and Beaver Creek Coal Company.

The reserves within the permit area are proposed for mining through 1994, however, access will be maintained through this permit area until all future reserves to the northwest and west are mined. Presently, Genwal Coal Company holds no further leases. Genwal has indicated an interest for coal reserves west of Lease U-54762 in the south one-forth of Section 31.

IV. Study Area

A. Geology

The formations exposed in the Wasatch Plateau are Tertiary and Cretaceous-aged sedimentary units (Figure 4). These formations are of both continental and marine origin and are comprised principally of shale and sandstone. Siltstone, mudstone and limestone occur in lesser amounts. The formations in the Wasatch Plateau area generally dip one to three degrees westward off the west flank of the San Rafael Swell. Regional dips are interrupted by principally east trending fold axes, and principally north trending fault axes.

Stratigraphic units outcropping within the study area include, from oldest to youngest, the Masuk Shale Member of the Mancos Shale, Starpoint Sandstone, Blackhawk Formation, Castlegate Sandstone, Price River Formation, North Horn Formation and Quaternary deposits. Lithologic descriptions and unit thicknesses are shown in Figure 3.

The Hiawatha Coal Seam, which is the coal seam to be mined in the new lease area, occurs at the base of the Blackhawk Formation. The Hiawatha Coal Seam has been mined in the Tract 1 and Tract 2 areas and is exposed at an approximate elevation of 7900 feet. Maximum overburden is approximately 1500 feet in the northwest corner of the Tract 2 Lease with an average overburden of approximately 800-900 feet. The entire permit area is underlain by the Starpoint Sandstone.

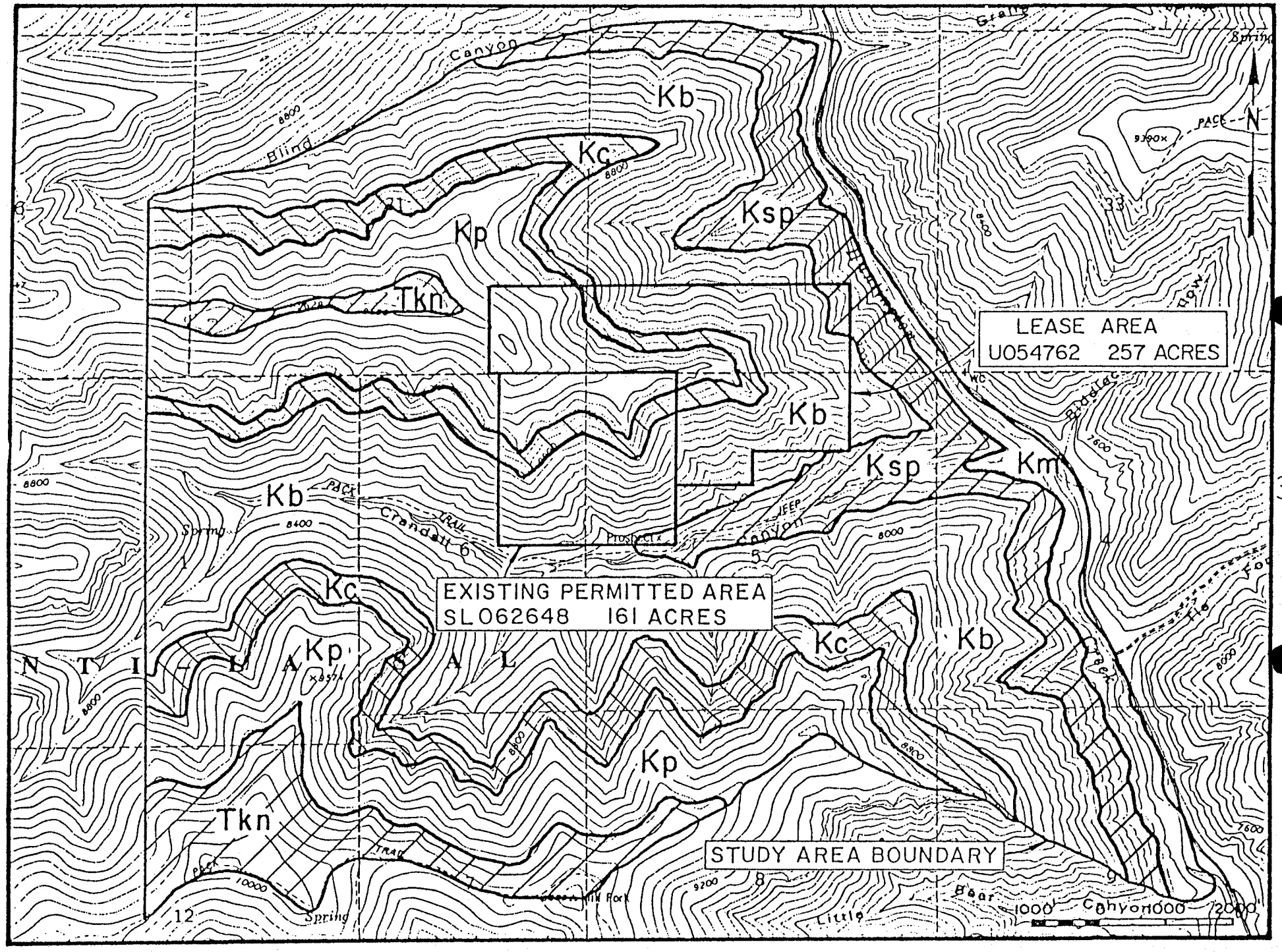


Figure 4 Geology of the Crandall Canyon Area (after Doelling, 1972).

B. Topography and Precipitation

Topography in the area is generally very steep and rugged with elevations ranging from approximately 7,200 feet to over 10,000 feet above sea level. Slopes vary from vertical cliffs to less than 2 percent. The CIA is characterized by Crandall Canyon Creek, which originates above 10,000 feet and drains east into Huntington Creek. The CIA also includes an unnamed ephemeral drainage to the west of the permit area that also drains to the east into Huntington Creek.

Precipitation in the Wasatch Plateau ranges from 10 inches to 40 inches annually. Average annual precipitation in the CIA is approximately 20 inches (Simons 1984).

C. Vegetation

There are five vegetative communities in the CIA including Sagebrush, Mountain Shrub/Grassland, Mixed Mountain Shrub, Conifer/Aspen and Spruce/Fir. Aspen are found on the north facing south slopes and higher up on the north slopes, on ridge tops. Spruce/Fir is also found on the north slopes and appears to be tied to both a moister site as well as areas with less sunlight. Mixed Mountain Shrub and Mountain Shrub/Grassland appear to be transitional and are predominant on the open exposed ridges at approximately mid-slope. The Sagebrush community follows primarily along the ridges and is more than likely climax in nature to the shrub grass associations.

V. Hydrologic Resources

A. Ground Water

The ground water regime within the CIA is dependent upon geologic and climatic parameters that establish systems of recharge, movement and discharge.

Snowmelt at higher elevations provides most of the ground water recharge, particularly where permeable lithologies or faults/ fractures are exposed at the surface. Vertical migration of ground water occurs through permeable rock units and/or along zones of faulting and fracturing. Lateral migration initiates when ground water encounters impermeable rocks and continues until either the land surface is intersected (and spring discharge occurs) or other permeable lithologies or zones are encountered that allow further vertical flow.

A seep and spring survey conducted by Earthfax Engineering in June and October of 1985 provided an indication of spring and seep locations (Figure 5), geologic conditions including lithologic and structural controls and the geologic formation from which the seepage issued. Flow rates, use and field characteristics were analyzed. Water samples were collected where sufficient flows were present.

Regional ground water conditions were determined from a review of available literature.

Six formations outcrop in and adjacent to the mine area. According to Doelling (1972), the Masuk Shale Member of the Mancos Shale is a light gray to blue-gray marine sandy shale in the mine vicinity. This unit is exposed at the mouth of Crandall Canyon and in adjacent areas along Huntington Creek. The Masuk Shale Member yields water locally to seeps and springs but does not serve as a regionally important aquifer (Danielson et al., 1981).

The Star Point Sandstone 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 approximately 300 feet thick. The Star Point serves as an important regional aquifer (Danielson et al., 1981), yielding water to several minor and some major springs where fractured and jointed.

The Blackhawk Formation is the principal coal-bearing unit in the region (Doelling, 1972). This formation consists of interbedded layers of sandstone, siltstone, shale, and coal, all of marine origin. The Blackhawk is approximately 700 feet thick in the mine area, with the principal coal seam (the Hiawatha seam) occurring near the bottom of the formation. The formation yields water to springs and coal mines when fractured. Where it is locally interbedded with the Star Point Sandstone, the lower portion of the Blackhawk Formation is considered an aquifer (Danielson et al., 1981).

The Castlegate Sandstone overlies the Blackhawk Formation and consists of tan to brown cliff-forming sandstones of fluvial origin. The sandstones are massive and medium- to coarse-grained. In the area of the mine, the Castlegate yields water locally to seeps and springs but does not serve as an important regional aquifer because it is commonly drained within short distances from its recharge area due to deeply incised canyons (Danielson et al., 1981).

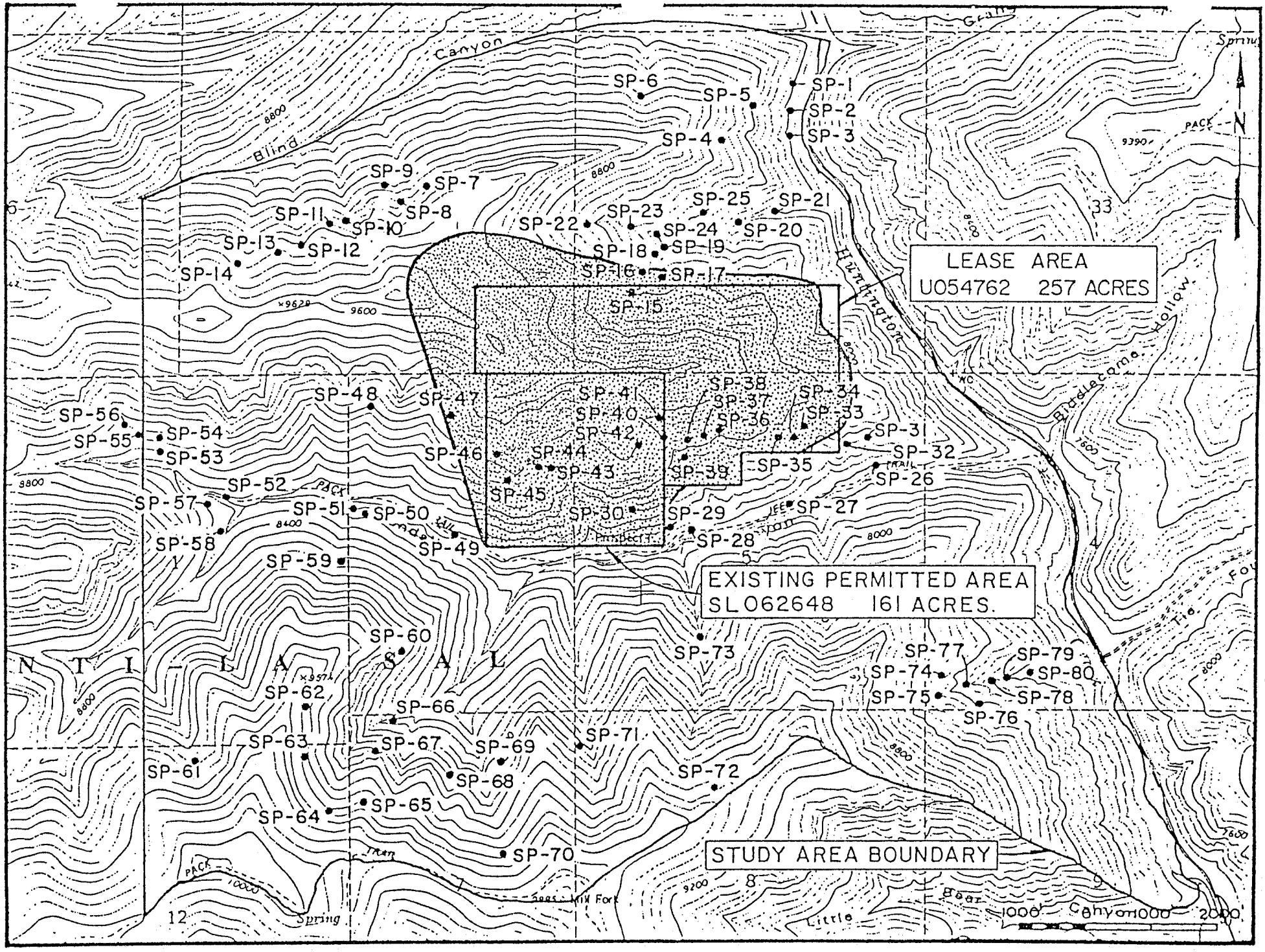


Figure 5 Maximum Area of Potential Subsidence.

The Price River Formation consists predominantly of friable limey sandstone interbedded with pebbly conglomerates and shales. It forms steep receding slopes and reaches a maximum thickness of about 500 feet in the mine area (Doelling, 1972). This formation yields water locally to seeps and springs (Danielson et al., 1981). However, like the Castlegate Sandstone, deeply incised canyons in the area prevent the Price River Formation from being an important regional aquifer.

The uppermost formation that outcrops within the area adjacent to the mine plan area is the North Horn Formation. This formation consists of interbedded limestones, sandstones, and shales (Doelling, 1972). Due to high topographic presence, the North Horn Formation in the CIA serves primarily as a recharge unit to underlying formations rather than as an important source of water itself.

Investigations by Danielson et al. (1981) indicated that most, if not all, ground water in the region is derived from snowmelt. Recharge tends to be limited in areas underlain by the Price River Formation and older rocks (relative to recharge in areas underlain by younger rocks) due to slope steepness and relative imperviousness (both of which promote runoff rather than infiltration of snowmelt).

Detailed potentiometric surface data are not available for the CIA, however, the operator installed a ground water monitoring well in March 1987. The well was drilled using air rotary methods to a total depth of 375 feet and encountered the Star Point Sandstone through the entire depth.

The driller indicated that the formation was relatively homogeneous except in the zone from 290 to 335 feet, where the sandstone became courser. It is from this zone that the well is producing water, with water first being encountered at a depth of about 315 feet. The static water level approximately one week after completion of the well was at a depth of 186.1 feet below ground surface.

Slug tests were performed on the completed well to determine hydraulic characteristics of the aquifer. The slug test data were analyzed using a method developed by Bouwer and Rice (1976). Transmissivities were calculated to be approximately 4.5 square feet per day assuming that the 45 foot producing zone accounts for the entire thickness of the aquifer at the site of MW-1.

The operator has committed to assess the piezometric surface of the Starpoint aquifer with the development of Lease U-54762. Two wells will be drilled within the mine before the end of the first quarter of 1989, which will allow a three point problem to be developed. Due to the steepness of the terrain and a roll within the coal seam emplacement of drilling equipment has been difficult.

Ground water inflow to the existing underground workings amounts to approximately 100 gallons per minute. The inflow is currently being used in the mining process. A modification of the NPDES permit has been obtained in the event that inflow exceeds the requirements for underground use and discharges from the mine occur .

The predominant chemical constituents in most springs in the region are calcium and bicarbonate (Danielson et al., 1981). Dissolved solids concentrations generally range from about 50 to 750 milligrams per liter. Regionally, the concentrations of major dissolved constituents in water from individual geologic units is highly variable, due to the complex lithologic nature of the area (Danielson et al., 1981).

Over 50 percent of the seeps and springs discovered during the June, 1985 inventory issued from the Blackhawk Formation. However, flow rates at these points were normally minimal (less than one gallon per minute), with seepage issuing predominantly at the interface between sandstone lenses above and less permeable shale layers below. Most of these seeps and springs had dried up prior to the October survey. Useage at these points of seepage is minimal, due to the low flow rate and inaccessibility of the seeps.

The low seepage rates measured in most of the seeps and springs issuing from Blackhawk Formation are due to the low hydraulic conductivity of the formation in its unfractured state. Laboratory permeability data provided by Lines (1985) from a core sample collected in Section 27, T. 17 S., R. 6 E. (approximately 10 miles south of the mine permit area) indicate that sandstone units within the Blackhawk Formation have an average horizontal hydraulic conductivity of 1.3×10^{-2} feet per day and an average vertical hydraulic conductivity of 3.8×10^{-3} feet per day. Shales and siltstones within the Blackhawk Formation were found to have maximum horizontal and vertical hydraulic conductivities of 1.0×10^{-7} and 1.2×10^{-6} feet per day, respectively.

The relatively large hydraulic conductivity of the sandstones of the Blackhawk Formation compared with the siltstone and shales indicates that the fine grained sediments of the formation serve as barriers to the downward movement of water. In simple terms, as water recharges the Blackhawk Formation (either through snowmelt, rainfall, or subsurface seepage from an adjacent formation), it is permitted to percolate downward within the sandstone beds.

However, upon reaching a less permeable siltstone or shale layer, the water is forced to flow horizontally to the surface, issuing at the interface between the two units.

Notable exceptions to the above generality concerning the Blackhawk Formation occur at a few springs that issue from fractured sandstone within the formation. Examples of this phenomenon were found in the western portion of the survey area, where flow rates of up to 15 gallons per minute were encountered during both the June and October inventories. Travertine deposits are common at these springs, suggesting that the recharge area for these springs is dominated by limestone (probably the North Horn Formation on the ridges to the north and west). The Blackhawk Formation apparently serves more as a conveyance body rather than a significant source of water to these springs.

Several seeps and springs issue at the site from colluvium overlying sandstone of the Blackhawk Formation and the Castlegate Sandstone. These seeps normally occur in drainage bottoms where shallow subsurface water collects at topographic lows. Nearly all flows from seeps of this type were insignificant in both June and October, suggesting (together with the topographic position) that these seeps are intermittent in nature.

Most seeps and springs issuing within the survey area from the Castlegate and Star Point Sandstones flow from bedding planes within these formations. Flows issuing in this manner were generally low during the June inventory (less than one gallon per minute) and nonexistent during the October inventory.

As noted, flow rates measured during the October survey were generally significantly less than those found during the June survey. In June, a total of 80 seeps or springs were found, 34 of which had sufficient flow to sample (the remaining 46 were seeps that could not be sampled). In October, 55 of the sources originally discovered were dry. An additional 7 sources existed only as seeps, with only 18 of the original sources containing sufficient flow to sample.

The results of the seep and spring inventory tend to support the conclusion of Danielson et al. (1981) that ground water occurs in most geologic formations at the site (all but the Masuk Shale Member of the Mancos Shale), but none of the units are saturated everywhere. No continuous zones of saturation appear to be present at the site, indicating that potentiometric surface maps would be difficult to prepare.

Based on the conclusions of Danielson et al. (1981), it is assumed that ground water within the permit and adjacent areas flows toward the main canyons (Crandall, Blind, and Huntington) and then along Huntington Canyon to the valley bottom.

The data indicates that the specific conductance of water issuing from springs in June generally increased with increasing stratigraphic depth. This is in agreement with findings of Danielson et al. (1981). Springs issuing from the Price River Formation typically had a specific conductance during the June survey that varied from 150 to 450 umhos/cm at 25°C while those issuing from the Blackhawk Formation and Star Point Sandstone had a specific conductance varying from 500 to 1000 umhos/cm at 25°C. This increase in specific conductance is indicative of leaching of minerals by the ground water as it flows through increasing distances of bedrock to the lower stratigraphic positions.

The pH of water issuing from springs in the survey area showed no trends within or between formations. Values varied from 6.80 to 8.57, averaging 7.74. Hence, spring water in the study area is slightly alkaline.

In those springs with sufficient water to sample, pH generally increased slightly between June and October. Increases normally amounted to 0.1 to 0.5 pH unit. Specific conductance showed no consistent pattern between the June and October data, with approximately as many increases as decreases between June and October.

Inflow to the existing underground workings amounts to approximately 100 gallons per minute. These inflows originate primarily in gob sections near the working face of the mine. Currently, water encountered in the mine is used underground in the mining process.

A list of surface water rights was obtained from the files of the Utah Division of Water Rights in September 1987. All surface water rights, indicated on Figure 3, are held by the U. S. Forest Service for stock watering purposes. Although the rights exist, usage of these rights are apparently curtailed.

B. Surface Water

Crandall Canyon is an east-flowing tributary of Huntington Creek, one of the major tributaries of the San Rafael River.

Huntington Creek had annual flows near Huntington ranging from 25,000 to 150,000 acre-feet during the period of October 1931 through September 1973, averaging 65,000 acre-feet per year (Waddell et al., 1981). Variations in the annual flow of Huntington Creek near Huntington are portrayed graphically in Figure 4.

Approximately 50 to 70 percent of streamflow in the mountain streams of the region occurs during May through July (Waddell et al., 1981). Streamflow during this late spring/early summer period is the result of snowmelt runoff. Such seasonal variations are common for streams in the area (Waddell et al., 1981).

The quality of water in Huntington Creek and other similar streams in the area varies significantly with distance downstream. Waddell et al. (1981) found that concentrations of dissolved solids varied from 125 to 375 milligrams per liter in reaches above major diversions to 1600 to 4025 milligrams per liter in reaches below major irrigation diversions and population centers. The major ions at the upper sites were found to be calcium, magnesium, and bicarbonate, whereas sodium and sulfate became more dominant at the lower sites. They attributed these changes to (1) diversion of water containing low dissolved solids concentrations, (2) subsequent irrigation and return drainage from moderate to highly saline soils, (3) ground water seepage, and (4) inflow of sewage and pollutants from population centers.

Average annual sediment yields within the Huntington Creek drainage basin range from approximately 0.1 acre-feet per square mile in the headwaters area to about 3.0 acre-feet per square mile near the confluence with the San Rafael River (Waddell et al., 1981). Increases in sediment yield with increasing distance downstream is generally the result of increasing amounts of shale and sandstone in the downstream direction (Waddell et al., 1981).

The U. S. Geological Survey established a gaging station at the mouth of Crandall Creek in 1978. Flow data collected at the gaging station are not complete for the winter in most years, due presumably to data acquisition problems. However, the limited data indicate that most of the flow of Crandall Creek occurs in the period of May through July, in keeping with the conclusions of Waddell et al. (1981). Assuming an average of 30 acre-feet per month for the period of missing record, the average annual flow for the six year period of data was 2740 acre-feet.

Surface water quality data collected from Crandall Creek by Genwal for the Tract 1 Lease from 1985 indicate that the dominant ions in Crandall Creek are calcium and bicarbonate. Total dissolved solids concentrations in the stream have varied from 180 to 286 milligrams per liter, with lower concentrations normally occurring during the high flow season. Total suspended solids concentrations in Crandall Creek have varied during the period of record from 0.5 to 208.0 milligrams per liter. As expected, the highest suspended solids concentrations generally occur during periods of highest flow.

VI. Potential Hydrologic Impacts

A. Ground Water

Dewatering and subsidence related to mining have the greatest potential for impacting ground water resources in the CIA.

Dewatering

Inflow into the existing underground workings amounts to approximately 100 gallon per minute. These inflows originate primarily in gob sections near the working face of the mine. Currently, water encountered in the mine is used underground in the mining process. Continued interception of mine inflow may potentially dewater certain localized aquifers not only during the first five year permit term but also throughout the life-of-mine as the workings are further developed.

Subsidence

Subsidence impacts are largely related to extension and expansion of the existing fracture system and upward propagation of new fractures. Potential area of impacts is shown on Figure 5. Inasmuch as vertical and lateral migration of water appears to be largely controlled by fracture conduits, readjustment or realignment in the conduit system may potentially produce changes in the configuration of ground-water flow. Potential changes include increased flow rates along fractures that have "opened" and diverting flow along new fractures or permeable lithologies. Subsurface flow diversions may cause the depletion of water in certain localized aquifers, whereas increased flow rates along fractures would reduce ground-water residence time and potentially improve water quality.

Therefore, mining may dewater certain localized aquifers and affect flow rates along existing or new subsidence related fractures. However, these impacts will be localized near the mine permit area. No other ground water disturbances exist within the CIA and cumulative hydrologic impacts are not expected.

B. Surface Water

The main concern in terms of impact to surface water is water quality deterioration downstream from the minesite, primarily in the form of suspended sediments. Typically the suspended sediment concentration in Crandall Canyon Creek since 1983 varied from approximately 205 mg/l to 0.5 mg/l. The low suspended sediment values are associated with natural climatic and geologic processes although a proportion may be attributed to surface disturbances from roads and the mine pad area. Sediment controls do exist for the disturbed surface areas. Therefore, the impact associated with mining in Crandall Canyon is minimized by surface controls (i.e., sediment pond, diversions, etc.). No other surface disturbances due to mining occur within the CIA and therefore cumulative hydrologic impacts are not expected.

The operational design proposed for the Crandall Canyon Mine is erein determined to be consistent with preventing damage to the hydrologic balance outside the mine plan area.

0689R

REFERENCES

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STIPULATIONS

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

Stipulations UMC 817.48 -(1-2) - JSL

1. Within 30 days of permit approval the operator must submit to the Division a commitment to sample and analyze any underground development materials temporarily stored at the surface immediately after the material is first exposed to the mine site and to treat or otherwise bury any identified acid- or toxic-forming materials within the required time frame.

2. Within 30 days of permit approval the operator must submit to the Division a commitment to monitor the roof, floor, midseam, and materials disposed of underground for its potential acid- or toxic-forming characteristic as defined in Table 6 of the Division's "Guidelines for the Management of Topsoil and Overburden". This analysis must be accomplished once a year or more if the general location of the mining operation changes or a change in the physio-chemical quality of the floor or roof is encountered.

Stipulation UMC 817.121-.126 -(1) - DWD

1. The applicant will be required to conduct quarterly visual subsidence/escarpment failure surveys of areas where mining has taken place beneath escarpment areas visible from Huntington and Crandall Canyons for a period of two years following development mining and again after recovery mining. During recovery mining operations under the escarpments, the frequency of visual surveys shall be increased to weekly intervals. The survey results shall be recorded and submitted to the Regulartory Authority no more than 30 days following the survey. In the event that escarpment failures occur above pillar recovery areas, the operator shall immediately cease pillar recovery under escarpments and notify the Regulatory Authority.

Pillar recovery operations in the escarpment areas may not proceed until specifically approved by the Regulatory Authority with the consent of the BLM and Forest Service.

A commitment to the requirements of this stipulation should be inserted in an appropriate section of the MRP and submitted to DOGM within 30 days of permit approval.

TECHNICAL ANALYSIS

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

UMC 817.41 Hydrologic Balance - DWD

Existing Environment and Applicant's Proposal

No material damage or diminution of value of foreseeable use of lands is expected to occur. The applicant plans to minimize changes to the prevailing hydrologic balance. The applicant describes the methodologies to be used to analyze and maintain the ground water conditions at and adjacent to the minesite in Chapters 3, 7 and 12 of the Mining and Reclamation Plan (MRP).

Compliance

The applicant complies with this section.

Stipulations

None

UMC 817.48 Hydrologic Balance: Acid-Forming and Toxic-Forming Materials - JSL

Existing Environment and Applicant's Proposal

The operator states in section 3.3.9 of the Mining and Reclamation Plan (MRP) that underground processing waste, coal processing waste and all potential acid- or toxic-forming materials generated by the mining operation will be returned to the underground workings for final disposal. The underground development waste may be brought to the surface and temporarily stored adjacent to the coal pile.

Section 6-2 includes the results of Acid-Base Accountability and a laboratory report characterizing the toxic-forming nature of the material. Sixty percent of the samples represented indicate a potential acid-forming nature. Two samples had a pH of 3.95, while another had a pH of 7.4. Selenium, boron, electrical conductivity and SAR were all below the limits of concern.

Compliance

The applicant's proposal does not adequately address the requirements of this section. The plan fails to commit to treat or otherwise bury any identified potential acid- or toxic-forming material within the required time frame and does not include an adequate data base for an acid- or toxic-forming potential determination for the New Lease Area.

Any underground development waste brought to the surface for temporary storage must be immediately sampled and analyzed for the parameters defined in Table 6 of the Division's "Guidelines for the Management of Topsoil and Overburden". If the material is found to be potentially acid- or toxic-forming it must be disposed of or treated within 30 days after the material is first exposed at the mine site.

The limited baseline data for the previously permitted area indicates that a possible acid-forming material exists. Several acid base potentials exceed the limitations for a potential acid-forming material, several do not. The acid base potentials run from -13.07 to 164 tons $CaCO_3$ per 1000 tons material. The pH ranges from 3.9 to 7.6. There are no representative samples of roof, floor or midseam for the New Lease Area to determine the variability of any acid- or toxic-forming materials. The operator has committed in item 3-8 that monitoring of the mine water discharge into Crandall Creek will be in accordance with the approved NPDES permit.

Stipulations UMC 817.48 -(1-2) - JSL

1. Within 30 days of permit approval the operator must submit to the Division a commitment to sample and analyze any underground development materials temporarily stored at the surface immediately after the material is first exposed to the mine site and to treat or otherwise bury any identified acid- or toxic-forming materials within the required time frame.

2. Within 30 days of permit approval the operator must submit to the Division a commitment to monitor the roof, floor, midseam, and materials disposed of underground for its potential acid- or toxic-forming characteristic as defined in Table 6 of the Division's "Guidelines for the Management of Topsoil and Overburden". This analysis must be accomplished once a year or more if the general location of the mining operation changes or a change in the physio-chemical quality of the floor or roof is encountered.

UMC 817.52 Hydrologic Balance: Surface and Ground Water Monitoring - RPS/DD

Existing Environment and Applicant's Proposal

Ground Water

The geologic characteristics in the vicinity of the mine area are described in Chapters 6 and 7.

Ground water hydrology is addressed in Chapter 7. The applicant conducted seep and spring surveys during June and October of 1985. Spring locations and monitoring sites are illustrated on Figures 7-2 and 7-3. Table 7-1 provides the baseline data obtained from 1985 surveys.

In March of 1987 the applicant developed a ground water monitoring well (MW-1, see Figure 7-4 for location). The well monitors the water level in the Star Point Sandstone at a level approximately 186 feet below the surface. During the first quarter of 1989 the operator will construct two wells (MW-2 and MW-3, see Figure 7-4) in the mine, which will be used to monitor the levels and quality of the Star Point Sandstone.

Water level measurements and water quality samples will be collected from the wells on a quarterly basis following completion. Water quality samples will be analyzed according to the list provided in Table 7-4.

Surface Water

The proposed new lease area is primarily located in the Crandall Canyon drainage basin and to a limited extent in an unnamed tributary to Huntington Creek. The lease area is comprised of surface lands that are primarily located in headwater areas (elevation approximately 9200 ft.) with no perennial or intermittent streams existing. Some very insignificant, mildly developed ephemeral drainages occur on the lease area. These areas are located in a relatively remote and inaccessible area. The applicant proposes no additional surface water monitoring sites for this area.

Compliance

The applicant is in compliance with this regulation.

Stipulations

None.

UMC 817.53 Transfer of Wells - DWD

Existing Environment and Applicant's Proposal

The applicant has addressed this issue in Volume 1, Chapter 3, pages 3-29 and 3-30 (submittal dated 2-10-88) in the MRP.

No transfer of wells will occur. The applicant intends to seal all wells at cessation of mining operations. Plans incorporating permanent sealing methods will be submitted to the Regulatory Authority at that time. The plans will include approved sealing methods.

Compliance

The information submitted by the applicant is sufficient to address this section.

Stipulation

None.

UMC 817.59 Coal Recovery - JRH

Existing Environment and Applicant's Proposal

Genwal proposes to add federal lease U-54762 to the permit area. This lease plus the currently approved lease areas are as listed below:

LEASE	TOTAL	ADDITIONAL	CURRENT
SL-062648	155.2	0	155.2
U-54762	256.5	256.5	0
TOTAL ACREAGE	411.7	256.5	155.2

Locations for the leases and lease modifications can be identified in the plan on Plate 2-1. Interests in contiguous lands to the permit area are shown on Plate 2-2 and indicate a potential for a proposed lease modification with the BLM in the future.

Development and production from these new and existing leases will be from the existing adjacent facilities. No new surface disturbance or additional surface facilities will be required in conjunction with the utilization of the proposed new lease.

Mining methodology for the new area is similar to that of the existing permit for Genwal. Mining will be conventional room and pillar methods with utilization of continuous miners. No longwall mining is anticipated for the project.

Old workings within the permit area are found on Plate 3-9. The portals and parts of the abandoned workings have been rehabilitated by Genwal and are part of the current mining activities.

Genwal indicates that there is approximately 2.5 million tons in place in the new lease with approximately 1.5 million tons recoverable. Estimates for recoverable tonnage are based on mining of coal to a minimum of five feet in thickness and a maximum of nine feet in thickness. Genwal considers that coal thicknesses less than five feet are not economic due to constraints of their existing equipment and current market conditions for coal.

The lower Blackhawk formation of the Wasatch Plateau is known to contain two mineable seams. The operator has concluded that only the lower seam is mineable in the Tract 1 area. Future drilling of the new lease area may determine that the upper seam is mineable and the operator will revise plans for the development of that seam if and when economic and geologic conditions warrant. The BLM has concurred with Genwal in a 1985 approval to commence pillaring of the lower (Hiawatha) seam in the Tract 1 area, since the upper (Blind Canyon) seam was not considered mineable.

The operator has submitted for approval and/or has received approval for roof control, ventilation and mining sequence plans from the BLM and MSHA.

Projected mining advance (sequence and timing of mining operations) is shown on Plate 3-3. Annual production is based on 360,000 tons per year. At this rate, the life of the mine based on the currently proposed lease areas is approximately five years. However, the operator intends on increasing the lease area and life of the mine as the opportunity and economic conditions allow.

Compliance

This section of the regulations is considered to be complete and technically adequate. The operator has detailed the timing and the sequence of the mining operation for the permit term and has indicated the extent of mining throughout the projected life of the mine.

New lease information has been included and incorporated into the MRP.

Stipulations

None.

UMC 817.71 Disposal of Excess Spoil and Underground Development Waste: General Requirements - JRH

Existing Environment and Applicant's Proposal

The Crandall Canyon Mine produces a run of mine coal product for final sale. Other than sizing and crushing of the coal product, no coal processing is anticipated for the facilities. Waste generated as a result of mining includes roof rock which is disposed of underground along the pillar lines prior to second mining or in locations where no second mining activity is proposed. The operator further maintains that disposal of this waste material will be in accordance with MSHA regulations.

Underground development waste, coal processing waste, sediment pond sludge and all potentially acid- or toxic-forming materials will be returned to underground workings. The underground waste that is brought to the surface or developed on the surface will be temporarily stored on the surface at the west end of the coal stockpile area. Permanent disposal of these materials will be underground in accordance with MSHA regulations.

Compliance

All facilities regarding the storage, treatment and disposal of excess spoils and mine development waste have been approved within the existing permit. No new surface facilities are proposed within the new coal lease area.

The addition of the new lease area will not significantly alter the current mining surface facilities and their operation. No additional waste materials or increased capacity for the storage and disposal of waste material is anticipated in the plan.

The applicant complies with this section.

Stipulations

None.

UMC 817.97 Protection of Fish, Wildlife and Related Environmental Resources - LK

Existing Conditions and Applicant's Proposal

General wildlife information and plans submitted and included in the approved MRP (Chapter 10 and Section 3.4.6) for the Crandall Canyon Mine contains information directly related to the new lease area and is appropriate and adequate for the permitting decision. Impacts to wildlife due to mining of the new lease could result from impacts related to subsidence upon seeps and springs and a historic eagle nest. The subsidence control and mitigation plan (Section 12.4.3) contains detailed information for avoiding impacts or mitigation of any impacts to these resources.

Compliance

Any significant impact to seeps and springs will be mitigated by placement of guzzlers in the area of the impacted seep or spring. Section 3.4.6.2 identifies a significant impact as a 50% reduction in flow and provides details of the mitigation plan.

Proposed plans to protect the eagle nest from subsidence related impacts include leaving barrier pillars. While Genwal would like to pull pillars in the area, monitoring of the nest will occur prior to pillaring the area directly affecting the nest. Based on the status and condition of the nest, a determination will be made in conjunction with the BLM, Utah Division of Wildlife Resources and the Division of any mitigation that may be necessary.

These plans are in compliance with the requirements of UMC 817.97.

Stipulations

None.

UMC 817.121-.126 Subsidence Control - DWD

Existing Environment and Applicant's Proposal

The applicant presents an updated subsidence control plan in Section 12.4.2 of the MRP (page 12-8). The new subsidence monitoring plan submitted November 11, 1988 will supercede the U. S. Forest Service's photogrametric study but use the same control stations. Information collected from the U.S. Forest Service's survey will be used for a baseline reference to the new plan. Every fifth year a color infrared survey will be conducted to monitor vegetation variation (page 12-13).

A survey was conducted for structures and renewable resources. Although no structures exist, renewable resources do exist as grazing and ground water sources. A study by Earthfax Engineering, Inc.(1985) identifies 80 springs and seeps, none used for human consumption, in the canyons and vicinity of the permit area, Figures 7-2 and 7-3. Sixteen of the springs exist on the permit area and flow less than one gallon per minute (Table 7-1).

Mining will be conducted as room and pillar development and extraction in the Hiawatha seam. The sequence of mining and pillar extraction has been illustrated on Plate 3-3.

Items 12-1 to 12-5 in Chapter 12 depict geotechnical information to illustrate magnitude and distribution of subsidence, which is expected to be a maximum of 70% or 3.9 feet of the coal seam (page 12-11).

The applicant has consulted with the Bureau of Land Management (BLM) and the Mine Safty and Health Administration (MSHA) in regards to maximizing roof control and coal recovery relative to sizing barrier and support pillars. A copy of the recovery and roof control plan is in Volume 1, Chapter 3, Item 3-1.

Compliance

Except as stated in the following comment the applicant has complied with the requirements of this regulation.

The U.S. Forest Service determined that mining induced slope/escarpment failures in Huntington Canyon would not be acceptable due to the sensitive nature of resource values and managment objectives for the area.

In a letter dated February 9, 1989 the U.S. Forest Service consented, under close monitoring, to allowing recovery mining beneath the escarpment/slope which involves less than 500 feet of overburden (up to 200 feet of the coal outcrop). These conclusions were based on available data, methodologies and observations presented in the BLM's Resource Recovery and Protection Plan. Adjacent mining operations with similar characteristics were also examined to ensure that no escarpment failure has occured.

Stipulation UMC 817.121-.126 -(1) - DWD

1. The applicant will be required to conduct quarterly visual subsidence/escarpment failure surveys of areas where mining has taken place beneath escarpment areas visible from Huntington and Crandall Canyons for a period of two years following development mining and again after recovery mining. During recovery mining operations under the escarpments, the frequency of visual surveys shall be increased to weekly intervals. The survey results shall be recorded and submitted to the Regulartory Authority no more than 30 days following the survey. In the event that escarpment failures occur above pillar recovery areas, the operator shall immediately cease pillar recovery under escarpments and notify the Regulatory Authority. Pillar recovery operations in the escarpment areas may not proceed until specifically approved by the Regulatory Authority with the consent of the BLM and Forest Service.

   A commitment to the requirements of this stipulation should be inserted in an appropriate section of the MRP and submitted to DOGM within 30 days of permit approval.

LETTERS OF CONCURRENCE

Genwal Coal Company, Inc.
Crandall Canyon Mine
New Lease
ACT/015/032
Emery County, Utah

July 31, 1989

Mine file
S. Linna

United States
Department of
Agriculture

Forest
Service

Manti-LaSal
National Forest

599 West Price River Dr.
Price, Utah 84501

Reply to: 2820

Date: February 9, 1989

RECEIVED
FEB 13 1989
DIVISION OF
OIL, GAS & MINING

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

RE: Five-Year Permit Renewal and New Lease Response, Genwal Coal Company, ACT/015/032, Emery County, Utah

Dear Lowell:

We have reviewed the Bureau of Land Management's letter to your office, dated January 27, 1989, which discusses their evaluation of the Resource Recovery and Protection Plan (R2P2) and escarpment protection. The evaluation was in response to review of the Five-Year Permit/New Lease Application and deficiencies identified by the Forest Service and the Utah Division of Oil, Gas and Mining.

The Forest Service determined that mining induced slope/escarpment failures in Huntington Canyon would not be acceptable due to the sensitive nature of resource values and management objectives for the area. The Huntington Canyon corridor is a high use access route (State Highway 31) and recreation area. Huntington Creek is an important, high quality fishery. The visual quality objective for the canyon area which can be viewed from State Highway 31, is Partial Retention. This means that the area will be managed to provide natural appearing scenery in the foreground and middleground as viewed from the canyon bottom and slopes. Any exception to Special Coal Lease Stipulation #13, which requires that mining be conducted in such a manner as to prevent surface subsidence that would cause escarpment failure and landslides, will not be considered for this lease.

In their letter, the Bureau stated that escarpment/slope failure should not be induced by mining as approved in the R2P2. They used rock mechanics theory and analytical estimations supported by the U.S. Bureau of Mines published report entitled "Stability of Mountain Slopes Undercut by Coal Mines, March 1983" to calculate that the 200' barrier pillar would provide a safety factor of 1.5 against slope failure. In addition to the calculations, the Bureau used empirical data based on field observations and aerial photographs to verify that similar mining operations in the area have extracted pillars under similar

slopes and have not caused escarpment/slope failures. We agree that based on present available empirical data and theoretical methods presented in the Bureau's determination, the probability of inducing escarpment/slope failure in Huntington Canyon is low.

The uncertainties which become obvious, however, involve the accuracy of theoretical calculations considering the complexities of evaluating nonhomogeneous rock materials, the lack of data regarding the extent to which subsidence has progressed in the mines used for comparison, and the possible north-west trending fault on the eastern portion of the lease.

In their letter, the Bureau recommended close subsidence and cliff monitoring, which would include installation of EDM prisms on the slope. In addition to monitoring, they stated that if signs of failure appear during pillar extraction, operations in the remaining areas under the escarpment could be limited to first mining. After discussing the approved R2P2 with the Bureau, we do not feel that installation of the prisms would provide the necessary warning that escarpment/slope failure will occur prior to an actual failure. Frequent inspections of the area during recovery mining and Genwal Coal Company's photogrammetric subsidence monitoring plan should, however, provide adequate detection of failures.

Considering the above information, we consent to second mining in the area under the escarpment/slope which involves less than 500 feet of overburden (up to 200 feet of the coal outcrop) as approved in the R2P2 and proposed in the Mining and Reclamation Plan. Our consent is, however, conditional upon the provisions that the escarpment areas will be inspected frequently during and after recovery mining and that recovery mining will be discontinued in areas with less than 500 feet of overburden, in the event that mining induced failures occur.

If you have any questions, please contact the Forest Supervisor's Office in Price, Utah.

Sincerely,

Aaron L Horne

for
GEORGE A. MORRIS
Forest Supervisor

ACT/015/032 #2

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

3482
U-54762
SL-062648
(U-067)

Moab District
San Rafael Resource Area
900 North 700 East
Price, Utah 84501

JAN 27 1989

RECEIVED
JAN 30 1989
DIVISION OF
OIL, GAS & MINING

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

Dear Ms. Linner:

We have received and reviewed the "Five-Year Permit Renewal and New Lease Response, Genwal Coal Company, ACT/015/032," dated December 12, 1988. This package involves responses to reviews and deficiencies from the Forest Service and your agency. We have no comments on items regarding reclamation and post-mining land use, as the permit area is entirely inside the Manti-LaSal National Forest. The package does contain amendments to the initial resource recovery and protection plan (R2P2) for the new Federal coal lease U-54762. The BLM had determined that the R2P2 submitted on February 11, 1988, met the requirements of 43 CFR 3482.1(b) on June 17, 1988. Since that time, the Forest Service and your agency have expressed concern for escarpment failure along Huntington and Crandall Canyons induced by mining subsidence. A subsidence evaluation by your staff (Darby, Staff Report, October 1988) contends that development of mine workings under low overburden creates the potential for subsidence-induced fractures extending to or near the surface which could cause a slope failure and reduce the stability of the escarpments.

The purpose of this correspondence is to provide the BLM's determination as to whether the R2P2 provides for the protection of escarpments as required by the lease terms, and still safely achieves maximum economic recovery.

Genwal plans to room-and-pillar mine lease U-54762. Main entries would extend east off existing workings in the present permit area. Room-and-pillar panels would then be driven north across the township line into Section 32. The panels would be six entries on 80x80-foot centers, with north-south barrier

pillars of 80 feet between panels. Genwal plans to second mine panel pillars on retreat. Previous pillar mining by Genwal in their original permit area averaged between 50 and 80 percent extraction of the 60x60-foot pillars. Mining is planned to extend to within 50 feet of property boundaries and 200 feet from outcrops. Overburden on the property runs from 0 at the outcrop to 1,500 feet in the northwest corner of the new lease.

The BLM has concluded that Genwal's proposed R2P2 has sufficient outcrop coal barrier pillars designed to eliminate the potential for slope failure. Our conclusion is supported by the U. S. Bureau of Mines published report entitled "Stability of Mountain Slopes Undercut by Coal Mines, March 1983" which uses rock mechanic theory and analytical estimations to help in predicting slope failure. Using the geologic conditions at Genwal and applying the methodology of this report, we have calculated that an outcrop barrier pillar of 200 feet in width would provide a safety factor of 1.5 against slope failure.

The BLM believes slope failure will not occur. However, the classical subsidence theory indicates that some subsidence will occur. The amount of subsidence can be expressed as a function of the width of mine opening, depth of overburden, and thickness of seam extracted. In Genwal's case, subsidence could be expected to occur under 500 feet or less of overburden. The maximum amount of subsidence should be a percentage of the seam thickness. Genwal calculated a maximum subsidence of about three feet of the six feet of coal extracted under 500 feet overburden. We believe that with no slope failure due to the outcrop barrier pillar, subsidence above mine workings will appear only as ground lowering. Surface degradation from subsidence should not occur. Observations at the mine tend to support this conclusion. Genwal mined the 2nd and 3rd South panels off 1st West in 1984 and 1985. Both these panels were room-and-pillar mined, with the pillars pulled on retreat. The south limits of the panels mined within 250 feet of the outcrop in Crandall Canyon and to within 300 feet of overburden. Visual observations from BLM and Forest Service personnel and aerial photos taken before and after mining have not detected any slope failure, slumping, or surface cracks above the mined areas. The BLM believes the analysis of potential slope failure is valid and that Genwal should be allowed to second mine up to 200 feet from the outcrop.

Likewise, the Bureau has concluded that the proposed R2P2 will not cause escarpment failure. This conclusion is based on some observed geologic features and case histories of mines in the area with like geologic conditions. Prediction of cliff failures due to mining-induced subsidence under second mining room-and-pillar areas using classical stress strain failure modes is extremely difficult due to the nonhomogeneous relationships of rock strata. Classical rock mechanics and subsidence theory is hard to apply to escarpments due to the unknown competency of the strata rock near the cliff. However, we do have some relevant case histories of mines in the vicinity, with like mining and geologic conditions that can give us a firm justification in our recommendations to the mining plan.

ACT 015 032 #2

cc S. Linner

Orig - mine file
~~route to L Braxton~~

STATE OF UTAH
NATURAL RESOURCES
Wildlife Resources

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
William H. Geer, Division Director

1596 West North Temple • Salt Lake City, UT 84116-3154 • 801-533-9333

January 31, 1989

RECEIVED
JAN 31 1989
DIVISION OF
OIL, GAS & MINING

Dr. Dianne R. Nielson, Director
Utah Division of Oil, Gas & Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

Attention: Susan Linner

Ref: Genwal Coal Company's Crandall Canyon Mine

Dear Dianne:

The Division has evaluated Genwal Coal Company's responses (12-27-88 and 1-23-89) to a review for the 5-year Mine and Reclamation Plan (MRP) renewal at their Crandall Canyon Mine. They have adequately responded to our concerns.

Thank you for an opportunity to review and provide comment.

Sincerely,

Timothy Provan
Acting Director

United States Department of the Interior
FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
UTAH STATE OFFICE
2078 ADMINISTRATION BUILDING
1745 WEST 1700 SOUTH
SALT LAKE CITY, UTAH 84104-5110

cc S. Lowry

TAKE PRIDE IN AMERICA

In Reply Refer To
(FWE)

February 28, 1989

RECEIVED
MAR 01 1989
DIVISION OF
OIL, GAS & MINING

Diane Nielson, Director
Division of Oil, Gas, and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180

Re: Genwal Coal Company, Crandall Canyon Mine ACT/015/032 Mine plan update

Dear Ms. Nielson:

We have examined the information provided by your correspondence of January 3 and January 31, 1989. Based upon the plan described, we believe that it provides adequate protection for the eagle nest located on the mine plan area.

One point of information -- Fish and Wildlife Service biologists observed nesting Williamson Sapsuckers in the Crandall Canyon area riparian habitat prior to the development of the mine.

Also, the plan indicates that if the eagle nest subsequently comes under threat from subsidence that a mitigation plan would be developed by the Divisions of Wildlife Resources and Oil, Gas and Mining. Keep in mind that no action can be approved that would result in loss of the nest without the issuance of an appropriate permit by the Fish and Wildlife Service. In addition, if the nest becomes "active" (occupied by adults, presence of eggs, or presence of young) no activities should be approved that might result in a "taking action" during that period of time.

We thank you for the opportunity of participating in your permitting actions for this mine and if we can be of further assistance contact Clark D. Johnson at 524-5649.

Sincerely,

Robert G. Ruesink

Robert G. Ruesink
State Supervisor

ML-89-0491

State of Utah

Division of State History
(Utah State Historical Society)
Department of Community and Economic Development

Norman H. Bangerter
Governor

Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
801-533-5755

RECEIVED BY
Monticello R.D.
DEC 5 1988

November 28, 1988

Mr. Les Wikle
Manti-LaSal National Forest
Monticello, Utah 84535

RE: Genwal Coal Company's Crandall Canyon Mine (Lease U-54762), Carbon County
(UT881102-020)

In Reply Please Refer To Case No. J885

Dear Mr. Wikle:

The staff of the Utah State Historic Preservation Office has received the above referenced report. We understand that the survey of approximately 10% of the coal lease area did not locate any cultural resources. The areas surveyed were level areas and potential rock art locations, or those areas likely to contain prehistoric resources. We concur with your recommendation that there will probably be no cultural resources located in the proposed coal lease area. The Forest Service can use this information in making any further recommendations on the project.

The above is provided on request as outlined by 36 CFR 800 or Utah Code, Title 63-18-37. The Utah SHPO makes no regulatory requirement in this matter. If you have questions or need additional assistance, please contact me at (801) 533-7039, or 533-6017.

Sincerely,

Diana Christensen
Regulation Assistance Coordinator

DC:J885/6429V FS/NP

RECEIVED
JAN 11 1989

Board of State History: Thomas G. Alexander, Chairman • Dean L. May, Vice Chairman • Douglas D. Alder
Phillip A. Bullen • Ellen G. Callister • J. Eldon Dorman • Hugh C. Garner • Dan E. Jones • Leonard J. Arrington • Amy Allen Price • Sunny Redd

/read all

Message 600-352
Subj: Recommendation for Genwal Coal Co.

TO: Joe Helfrich, SRA, Utah

FROM: Frank Fridecky, AVS Clearinghouse

SUBJECT: Recommendation for Genwal Coal Co.

DATE: July 31 ,1989

AVS Clearinghouse recommends issue for Genwal Coal Co., Application Number ACT015032.

If there are any questions, please contact the AVS Clearinghouse at 1-800-327-8245.

cc: Gary Fritz, New Mexico FO

[PC ID 20:DOI370025:20754]

152E for 152G22 14:37 MDT 31-Jul-89 Message 600-352 [1] * Read *

Action?:
[Done]

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

This permit, ACT/015/032, is issued for the state of Utah by the Utah Division of Oil, Gas and Mining (DOGM) to:

Genwal Coal Company
P. O. Box 1201
Huntington, Utah 84528
(801) 687-9813

for the Crandall Canyon Mine. Genwal Coal Company is the lessee of federal coal lease SL-062648 and the lessee of a fee-owned parcel affected by surface operations. A performance bond is filed with the DOGM in the amount of $268,000.00, payable to the state of Utah, Division of Oil, Gas and Mining and the Office of Surface Mining Reclamation and Enforcement (OSMRE). DOGM must receive a copy of this permit signed and dated by the permittee.

Sec. 1 STATUTES AND REGULATIONS - This permit is issued pursuant to the Utah Coal Mining and Reclamation Act of 1979, Utah Code Annotated (UCA) 40-10-1 et seq, hereafter referred to as the Act.

Sec. 2 PERMIT AREA - The permittee is authorized to conduct underground coal mining activities on the following described lands (as shown on the map appended as Attachment B) within the permit area at the Crandall Canyon Mine situated in the state of Utah, Emery County, and located:

<u>Township 15 South, Range 7 East, SLBM</u>

Section 31: SE 1/4 SE 1/4
Section 32: S 1/2 SW 1/4, SW 1/4 SE 1/4

<u>Township 16 South, Range 7 East, SLBM</u>

Section 5: SW 1/4 NW 1/4, Lots 2,3, 4 and 8
Section 6: SE 1/4 NE 1/4, Lot 1 (NE 1/4 NE 1/4)

This legal description is for the permit area (as shown on Attachment B) of the Crandall Canyon Mine. The permittee is authorized to conduct underground coal mining activities connected with mining on the foregoing described property subject to the conditions of the lease, the approved mining plan, including all conditions and all other applicable conditions, laws and regulations.

Sec. 3 PERMIT TERM - This revised permit is effective on July 27, 1989 and expires on May 13, 1993.

Sec. 4 ASSIGNMENT OF PERMIT RIGHTS - The permit rights may not be transferred, assigned or sold without the approval of the Director, DOGM. Transfer, assignment or sale of permit rights must be done in accordance with applicable regulations, including but not limited to 30 CFR 740.13(e) and UMC 788.17-.19.

Sec. 5 RIGHT OF ENTRY - The permittee shall allow the authorized representative of the DOGM, including but not limited to inspectors, and representatives of OSMRE, without advance notice or a search warrant, upon presentation of appropriate credentials, and without delay to:

A. have the rights of entry provided for in 30 CFR 840.12, UMC 840.12, 30 CFR 842.13 and UMC 842.13; and,

B. be accompanied by private persons for the purpose of conducting an inspection in accordance with UMC 842.12 and 30 CFR 842, when the inspection is in response to an alleged violation reported by the private person.

Sec. 6 SCOPE OF OPERATIONS - The permittee shall conduct underground coal mining activities only on those lands specifically designated as within the permit area on the maps submitted in the mining and reclamation plan and permit application and approved for the term of the permit and which are subject to the performance bond.

Sec. 7 ENVIRONMENTAL IMPACTS - The permittee shall minimize any adverse impact to the environment or public health and safety through but not limited to:

A. accelerated monitoring to determine the nature and extent of noncompliance and the results of the noncompliance;

B. immediate implementation of measures necessary to comply; and

C. warning, as soon as possible after learning of such noncompliance, any person whose health and safety is in imminent danger due to the noncompliance.

Sec. 8 DISPOSAL OF POLLUTANTS - The permittee shall dispose of solids, sludge, filter backwash or pollutants in the course of treatment or control of waters or emissions to the air in the manner required by the approved Utah State Program and the Federal Lands Program which prevents violation of any applicable state or federal law.

Sec. 9 CONDUCT OF OPERATIONS - The permittee shall conduct its operations:

A. in accordance with the terms of the permit to prevent significant, imminent environmental harm to the health and safety of the public; and

B. utilizing methods specified as conditions of the permit by DOGM in approving alternative methods of compliance with the performance standards of the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 10 AUTHORIZED AGENT - The permittee shall provide the names, addresses and telephone numbers of persons responsible for operations under the permit to whom notices and orders are to be delivered.

Sec. 11 COMPLIANCE WITH OTHER LAWS - The permittee shall comply with the provisions of the Water Pollution Control Act (33 USC 1151 et seq,) and the Clean Air Act (42 USC 7401 et seq), UCA 26-11-1 et seq, and UCA 26-13-1 et seq.

Sec. 12 PERMIT RENEWAL - Upon expiration, this permit may be renewed for areas within the boundaries of the existing permit in accordance with the Act, the approved Utah State Program and the Federal Lands Program.

Sec. 13 CULTURAL RESOURCES - If during the course of mining operations, previously unidentified cultural resources are discovered, the permittee shall ensure that the site(s) is not disturbed and shall notify DOGM. DOGM, after coordination with OSMRE, shall inform the permittee of necessary actions required. The permittee shall implement the mitigation measures required by DOGM within the time frame specified by DOGM.

Sec. 14 APPEALS - The permittee shall have the right to appeal as provided for under UMC 787.

Sec. 15 SPECIAL CONDITIONS - In addition to the general obligations and/or requirements set out in the leases, the federal mining plan approval, and this permit, the permittee shall comply with the special conditions appended hereto as Attachment A.

The above conditions (Secs. 1-15) are also imposed upon the permittee's agents and employees. The failure or refusal of any of these persons to comply with these conditions shall be deemed a failure of the permittee to comply with the terms of this permit and the lease. The permittee shall require his agents, contractors and subcontractors involved in activities concerning this permit to include these conditions in the contracts between and among them. These conditions may be revised or amended, in writing, by the mutual consent of DOGM and the permittee at any time to adjust to changed conditions or to correct an oversight. DOGM may amend these conditions at any time without the consent of the permittee in order to make them consistent with any new federal or state statutes and any new regulations.

THE STATE OF UTAH

By: Dianne R. Nielson

Date: July 31, 1989

I certify that I have read, understand and accept the requirements of this permit and any special conditions attached.

_____

Authorized Representative of the Permittee

Date: _____

APPROVED AS TO FORM:

By: Alan S. Bachman

Assistant Attorney General

Date: July 31, 1989

ATTACHMENT A

STIPULATIONS

Genwal Coal Company
Crandall Canyon Mine
ACT/015/032
Emery County, Utah

July 31, 1989

Stipulations UMC 817.48 -(1-2) - JSL

1. Within 30 days of permit approval the operator must submit to the Division a commitment to sample and analyze any underground development materials temporarily stored at the surface immediately after the material is first exposed to the mine site and to treat or otherwise bury any identified acid- or toxic-forming materials within the required time frame.

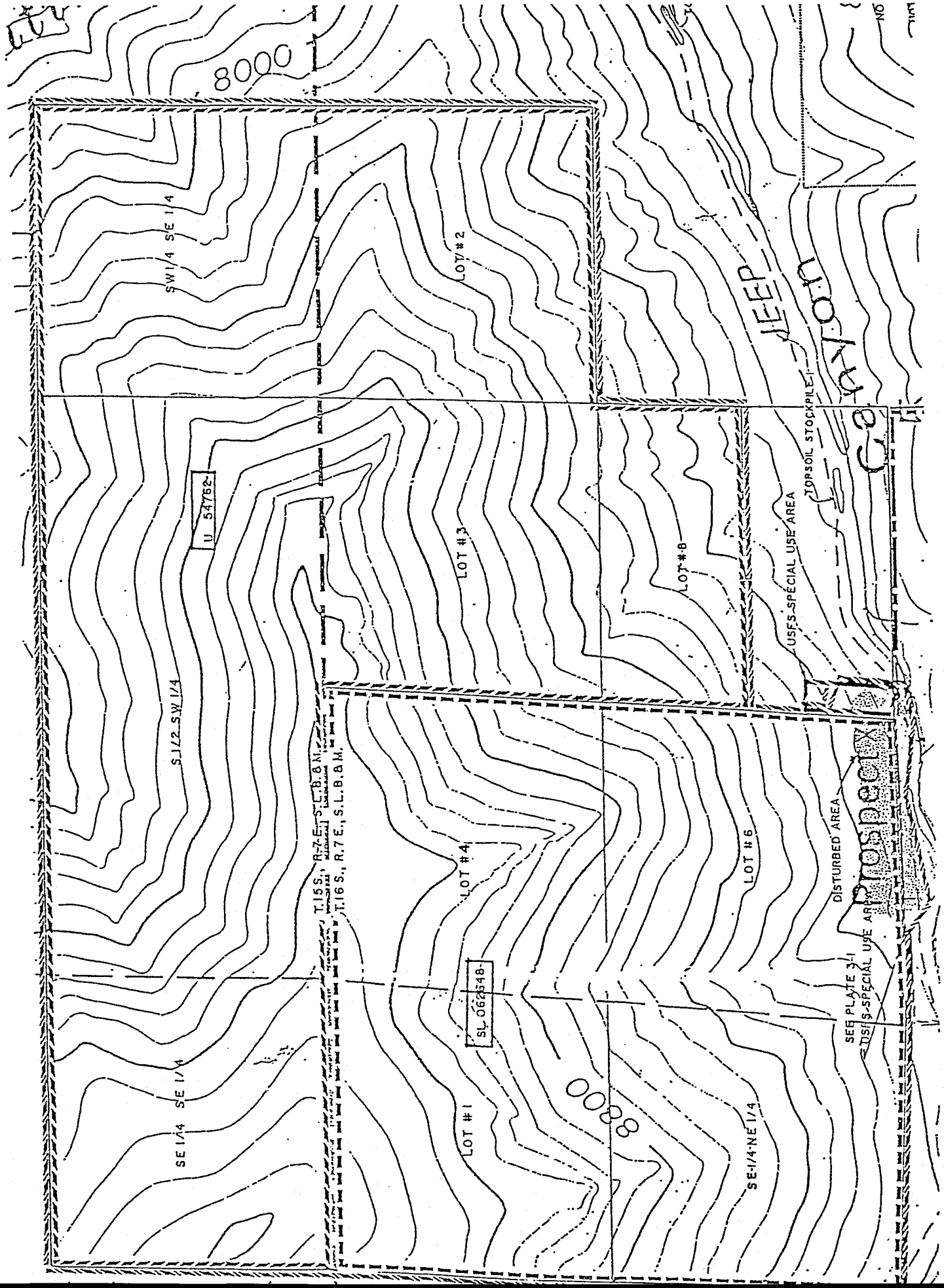
2. Within 30 days of permit approval the operator must submit to the Division a commitment to monitor the roof, floor, midseam, and materials disposed of underground for its potential acid- or toxic-forming characteristic as defined in Table 6 of the Division's "Guidelines for the Management of Topsoil and Overburden". This analysis must be accomplished once a year or more if the general location of the mining operation changes or a change in the physio-chemical quality of the floor or roof is encountered.

Stipulation UMC 817.121-.126 -(1) - DWD

1. The applicant will be required to conduct quarterly visual subsidence/escarpment failure surveys of areas where mining has taken place beneath escarpment areas visible from Huntington and Crandall Canyons for a period of two years following development mining and again after recovery mining. During recovery mining operations under the escarpments, the frequency of visual surveys shall be increased to weekly intervals. The survey results shall be recorded and submitted to the Regulartory Authority no more than 30 days following the survey. In the event that escarpment failures occur above pillar recovery areas, the operator shall immediately cease pillar recovery under escarpments and notify the Regulatory Authority. Pillar recovery operations in the escarpment areas may not proceed until specifically approved by the Regulatory Authority with the consent of the BLM and Forest Service.

   A commitment to the requirements of this stipulation should be inserted in an appropriate section of the MRP and submitted to DOGM within 30 days of permit approval.

ATTACHMENT B
CRANDALL CANYON MINE
PERMIT AREA



STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
(801) 538-5340

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Genwal Coal Company
P. O. Box 1201
Huntington, Utah 84528
(801) 687-9813

for the Crandall Canyon Mine. Genwal Coal Company is the lessee of federal coal lease SL-062648 and the lessee of a fee-owned parcel affected by surface operations. A performance bond is filed with the DOGM in the amount of $268,000.00, payable to the state of Utah, Division of Oil, Gas and Mining and the Office of Surface Mining Reclamation and Enforcement (OSMRE). DOGM must receive a copy of this permit signed and dated by the permittee.

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B. immediate implementation of measures necessary to comply; and

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THE STATE OF UTAH

By: Dianne R. Nielson

Date: July 31, 1989

I certify that I have read, understand and accept the requirements of this permit and any special conditions attached.

_____

Authorized Representative of the Permittee

Date: _____

APPROVED AS TO FORM:

By: Alan S. Bachman

Assistant Attorney General

Date: July 31, 1989

ATTACHMENT A

STIPULATIONS

Genwal Coal Company
Crandall Canyon Mine
ACT/015/032
Emery County, Utah

July 31, 1989

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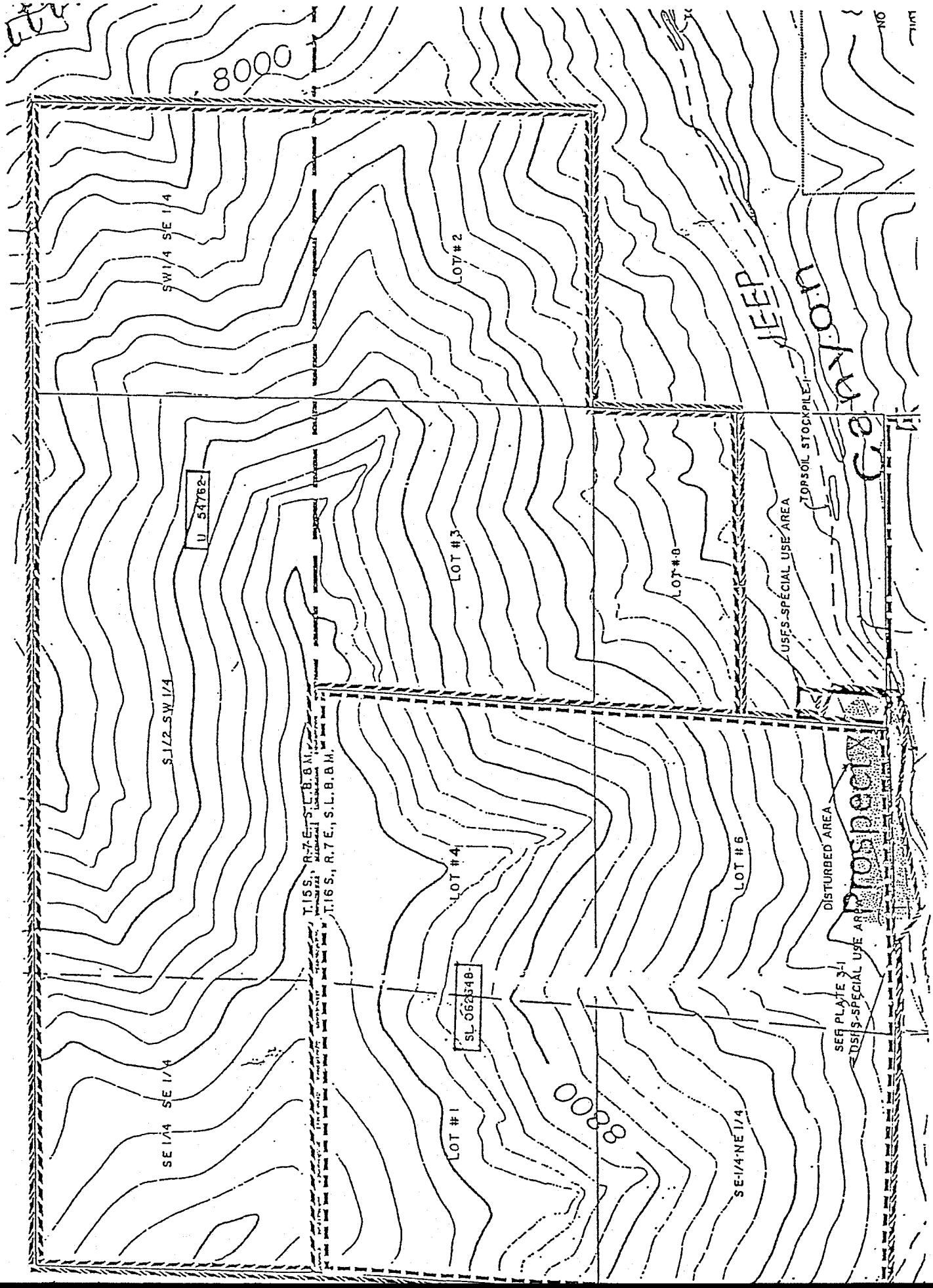
   A commitment to the requirements of this stipulation should be inserted in an appropriate section of the MRP and submitted to DOGM within 30 days of permit approval.

ATTACHMENT B
CRANDALL CANYON MINE
PERMIT AREA