



# 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.

Beaver Creek Coal Company, a subsidiary of Arco, Inc., operated the Huntington No. 4 Mine from 1977 to the last part of 1984. This mine is located in Mill Fork Canyon, 2 1/2 miles south of the Crandall Canyon Mine in Section 16, T. 16 S., R. 7 E., SLB&M.

The escarpment over this mine has areas of 200- to 300-foot vertical cliffs, whereas, at the Genwal Mine, the maximum of vertical cliff relief is less than 100 feet. Beaver Creek extracted the Blind Canyon seam with room-and-pillar mining under much of the cliff area in Mill Fork Canyon. The seam height was five to seven feet and much of the development areas were second mined. Aerial photos and observations from the Forest Service and Price BLM individuals have shown no failure or surface manifestations above any of the Huntington No. 4 workings.

Another mine in the area, the Trail Canyon Mine, Co-op Mining Company operator, has done extensive mining under cliffs and has not subsided the cliffs. This mine pulled extensive blocks of coal up to ten feet thick which, according to mine maps in our possession, nearly extracted the entire seam in the NW1/4 of Section 26, T. 16 S., R. 7 E., SLB&M. Again, no observable cliff failure has occurred.

Finally, Genwal has mined the 1st, 2nd and 3rd West panels in the original permit area. These panels were mined with room-and-pillar methods, with pillar extraction on retreat. The 3rd West and part of the 2nd West panels mined under the Castlegate cliffs in the NE1/4 of the NW1/4, Section 6, T. 16 S., R. 7 E., SLB&M. Recent aerial photos were compared with photos before mining. No detectable failure or cliff spalling were noticed. Observations by mine personnel and Forest Service personnel could not find any signs of subsidence.

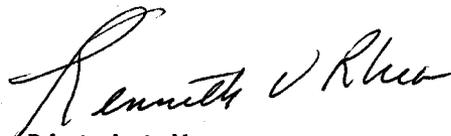
In summary, we conclude that the R2P2, as proposed by Genwal, will protect surface resources from damage due to mining-induced subsidence. This recommendation is contingent upon close subsidence and cliff monitoring. Should signs of failure appear, the mining can be limited to first mining, as Genwal has calculated adequate pillar strength against failure. We suggest establishing prism locations on the cliffs to monitor any movement. Ideal locations would be near the north section line on the NE1/4 of the NW1/4, Section 5, T. 16 S., R. 7 E., SLB&M. Monitoring should detect any preliminary movement on the escarpment.

The alternative for escarpment protection is to leave more coal unmined and sterilized. If Genwal has to first mine only under 500-foot cover, we calculate that approximately 260,000 tons of coal that would have been recovered with second mining would not be recovered and lost. Under the proposed mining plan, we conclude by the above-mentioned items that the risk of subsidence damage is minimal. To reduce a minimal risk by leaving more coal is an unwarranted loss of the coal resource.

We hereby reaffirm that the R2P2 meets the requirements of all applicable laws and recommend that the permit application and renewal be granted.

Please contact Brent Northrup of my staff or Stephen Falk in our San Rafael Resource Area office in Price if we can be of further assistance.

Sincerely yours,



Kenneth V. Rhee

District Manager

cc: Genwal Coal Company  
Manti-LaSal National Forest, Price, Utah  
SD, Utah (U-921)

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